FOR
BETTER MANAGEMENT
OF
PLANT OPERATIONS

FACTORY

december 1960

PRICE ONE DOLLAR

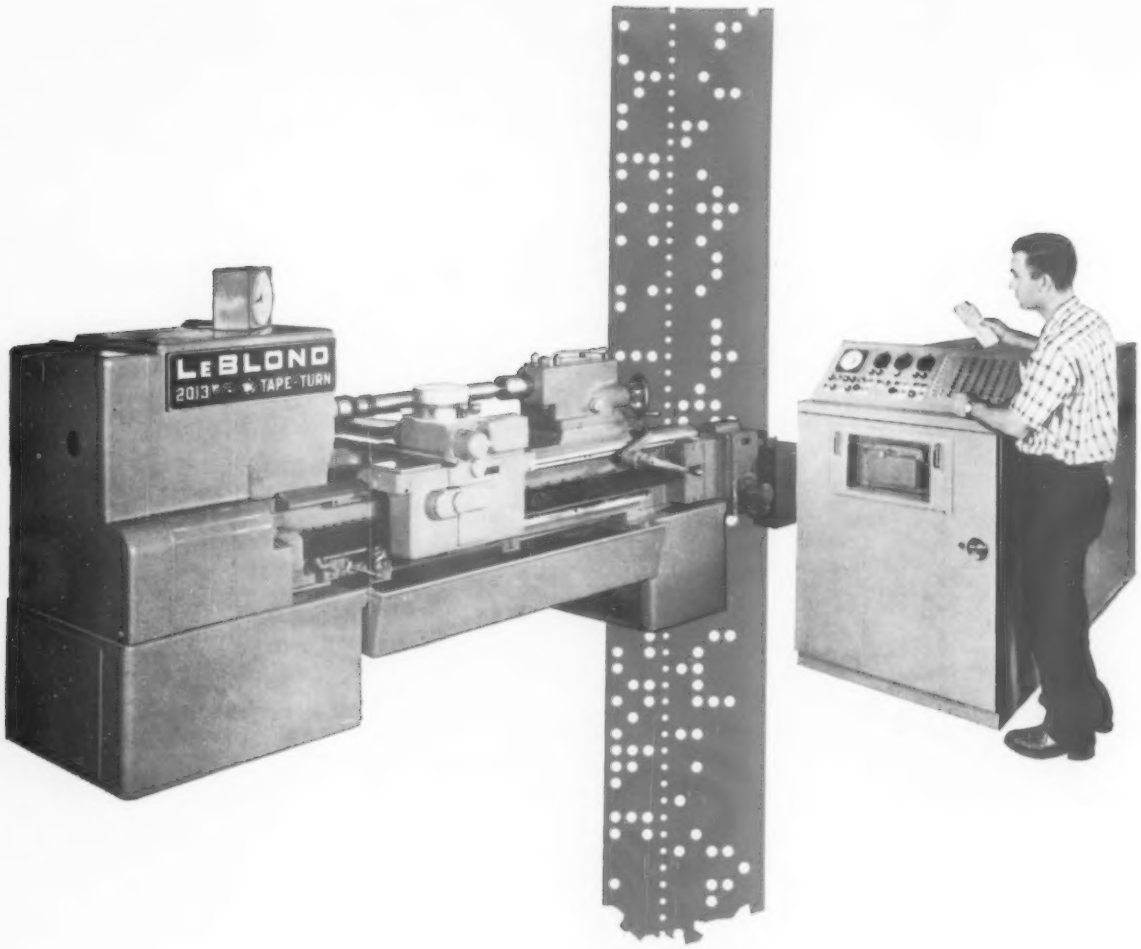
A McGRAW-HILL PUBLICATION

CRUCIAL TEST
FOR QUALITY
p. 66

THE NEWEST
SEMICONDUCTORS
p. 82

BETTER RECORDS
MANAGEMENT
p. 93

◀COVER STORY
RESCUED PLANT
IS GOOD AS NEW
p. 60



TURN WITH TAPE

Do it with TAPE TURN, the lathe that turns contours by numerical control; and tapers, sharp angles, radii, facing cuts and plunge cuts besides, not to mention heavy duty straight turning. No need for handwheels and levers. This lathe takes orders remotely from standard 1" 8-channel punched tape or a convenient pushbutton keyboard.

Tape-Turn puts engineering specifications at the cutting edge. Production Control can maintain control. Command by General Electric's new Mark Century numerical control. Full zero offset. Manual overrides at the console.

Turn contoured parts like this with tape and cut costs up to 75 per cent over tracer turning. Full range of spindle speeds and horsepower, all the beef you need for heavy production turning with LeBlond Tape-Turn models in several sizes. Write for documented savings with Tape-Turn, or ask your LeBlond representative for the Tape-Turn bulletin.

LEBLOND of Cincinnati

THE R. K. LEBLOND MACHINE TOOL CO. *World's Largest Builder of a Complete Line of Lathes* MADISON AT EDWARDS ROADS, CINCINNATI 8, OHIO

For more facts circle 382 on READER SERVICE CARD

Photo courtesy Chemical Tank Lines, Inc., Downingtown, Penna.

Hose gulps dry cement, unloads truck in 30 minutes

Fast handling of bulk cement gets big assist from B.F.Goodrich hose

WHOOSHING through that hose at a 5-barrel-a-minute clip is dry cement on its way to storage hoppers. Unloading with hose instead of screw-type metal conveyors is faster and cleaner; hook-ups are easier to make. But the job couldn't be done with an ordinary hose. Friction of the abrasive particles would wear it out fast.

A big equipment manufacturer brought the problem to B.F.Goodrich. Specifications were worked out, and a hose with a special kind of lining was recommended. This lining is so tough it has been used in some places to handle broken glass and granite chips.

Now, with B.F.Goodrich hose, bulk trailers operated by Chemical Tank Lines, Inc., Penna., can unload 113 barrels of cement in 30 minutes. The hose in the picture has been used 15 months, shows no sign of wearing out.

Because it's light and flexible, workmen find this BFG hose easy to handle, fast to connect. No need to jockey trucks back and forth to find just the right spot. The hose cover is built to take dragging over rough ground, exposure to all kinds of weather.

For more information on this new cement-handling hose—or any of the many different products BFG makes for industry, write *B.F.Goodrich Industrial Products Co., Dept. M-923, Akron 18, Ohio.*

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CEMENT-HANDLING HOSE

FOR BETTER
• PLANT MAINTENANCE & ENGINEERING
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DECEMBER 1960

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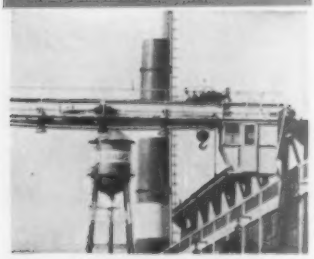


COVER STORY—Good as new—and 30 years old **60**
A dynamic management team solves two plants' problems.

Today's crisis in quality control **66**
The white goods industry learns its lessons the hard way.

Horse sense—it's not enough in employment testing **70**
Your plant needs some professional aid for a top program.

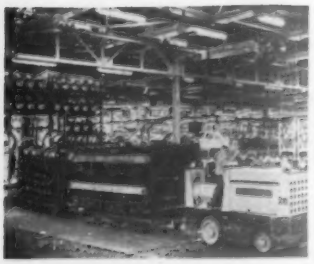
Maintenance painting **73**
E & T Report No. 9 covers the subject.

Automatic plant lunchrooms **80**
Dazzling new devices dispense refreshments—and relief.

Silicon controlled rectifiers **82**
They're part of your plant's electrical future.

More manufacturing information **86**
Another—and better—way to make data work for you.

In-plant packaging for profits **88**
A plan for wringing costs from cartons.



Will you be ready? **92**
Ready with up-to-date plans for plant improvements.

Better records management **93**
Scores of ideas on making paperwork less of a mess.

Trackless trains on a timetable **98**
Material flows smoothly in this well-planned system.

Maintenance system almost runs itself **176**
With cards, maps, and racks to do the worrying for you.

CASE BOOK p. 139

Electronic scanner controls 24 welding units at Chrysler so two don't fire at once, causing a voltage drop (page 140) . . . Conference room with built-in politeness shuts up bores at Forest Oil (page 141) . . . Tumblers shake, rattle, and roll while deburring gun receivers at Winchester (page 143) . . . Electrostatic touch-up booth has slashed production painting costs dramatically at Hampden Specialty Products (page 146).

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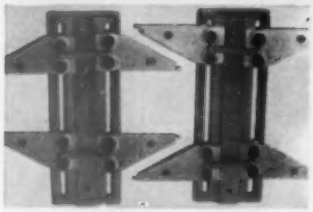

PRESS TIME REPORT: Looking ahead in business, Problem-solving guide, Cost index of plant maintenance, and Looking ahead in labor ..... *after* **52**
EDITORIAL: A year of accomplishment for operating management **59**
EQUIPMENT NEWS: No special gauging needed with go/not-go gauge **102**
LABOR RELATIONS NEWS: When and where on tests for job applicants **162**
CATALOG NEWS: December's list has some interesting new processes **184**
MATERIALS NEWS: Nylon serves for bumper plates and wear pads **204**

DEPARTMENTS

LETTERS: Author meets critic, both praise recent article **6**
IDEAS OF THE MONTH: Save capital with rented lighting equipment **132**
HUMAN RELATIONS: Blood donors respond to lure of the tropics **154**
BOOKS: This tome on talking can help you manage **196**
FLIMS: Help on corrosion, flaw location, air pollution **200**
ADVERTISERS' LITERATURE: On scores of products, services **214**

COMING

In January read and see how foreign firms are closing the gap on product quality. Reports from all over the world prove that America's plant men must work hard to stay ahead . . . You'll also read about an organization plan that makes the plant engineer more productive at Ford. **In coming months** look for articles on worker retirement, safety, and other plant functions such as production, maintenance, and engineering.

COVER

Managers (left to right) Brawner, Ackerman, and Elges study plans in renovated plant's power house. Adding timeliness to the story: the coming Industrial Building Congress and Exposition on Dec. 12-15 at the New York Coliseum.

Painting by Frank Lacano

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Here, in the 22,000 square miles served by Niagara Mohawk, nearly every type of industry can find the plant site admirably suited to its needs . . . the site from which to serve the richest market in the world . . . the great Northeast.

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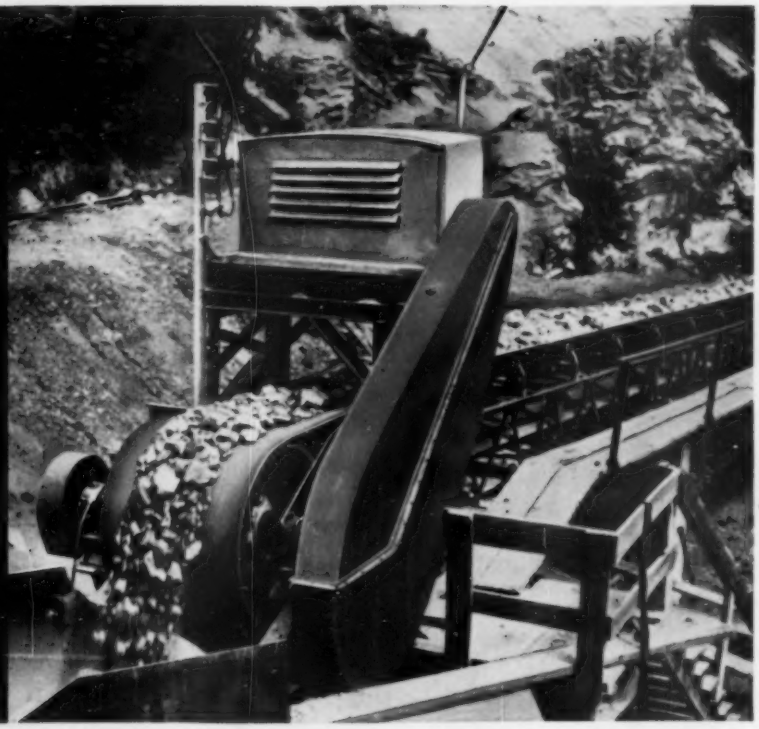
GOODYEAR

Now...
to remake belting
history..!

INDUSTRIAL



...the conveyor belting built for the belt-killers

This is it! New Industrial UNIFLO is the *first* woven-carcass rubber belting specifically designed to make history in hard-rock mining, quarrying, steel mills, pulp mills, foundries and the like.

New Industrial UNIFLO construction is available in a variety of compounds and gauges—including heat- and oil-resistant types. And extensive tests—underground and above-ground alike—have proved its superior capabilities under the toughest operating conditions.

To be specific, UNIFLO construction has . . .

. . . **proved** its unparalleled resistance to internal rupture caused by trapped material or pulley build-up

. . . **proved** its tear-resistance 3 times as great as comparable synthetic fabric-reinforced belts—10 times as great as comparable cotton-reinforced belts

. . . **proved** its excellent impact-resistance

. . . **proved** its unusually fine cover adhesion and cut-resistance

. . . **proved** its outstanding troughability and trainability

. . . **proved** its exceptional edgewear resistance

. . . **proved** its top-rank fastener-retention—handling wet or dry materials

But these are only the highlights of the great new Industrial UNIFLO Belting. For complete details, check with the G.T.M. – Goodyear Technical Man – through your Goodyear Distributor. Or write Goodyear, Industrial Products Division, Akron 16, Ohio.

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GTM-Specified

Industrial UNIFLO conveyor belting for severe above-ground service . . .

A Seamless, tough covers in a full range of compounds and thicknesses for superior protection against cuts, abrasion, heat and oil

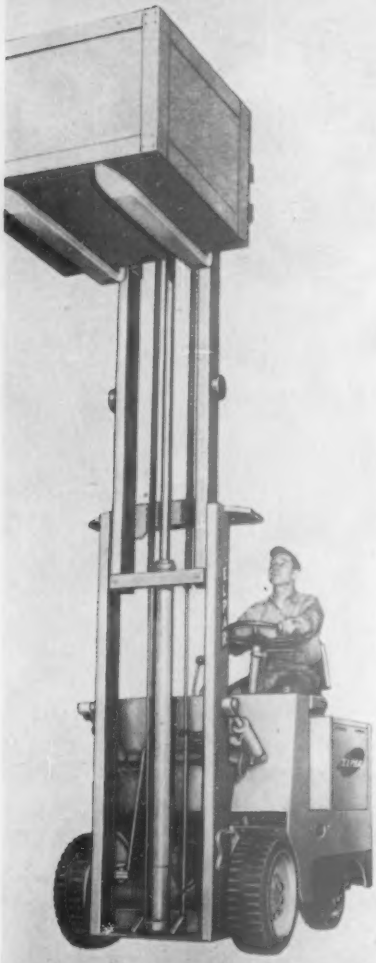
B Single unit carcass of high-tensile, interwoven yarn bonded to the cover under high pressure to give you exceptional strength and fastener-holding qualities — good troughability and trainability

Lots of good things
come from

INDUSTRIAL PRODUCTS

Unifloe-T.M. The Goodyear Tire & Rubber Company, Akron, Ohio

ACRO-SMOOTH



Slashes Truck Maintenance 55%

• A new concept in truck design . . . with step-less speed control . . . demountable electrical and hydraulic controls . . . easier service accessability . . . plus, a host of other important features that can halve your maintenance. Eliminate accidents . . . increase work output with ELPAR's new "Acro-Smooth", 4,000, 5,000, 6,000 and 7,000 lbs. capacity.

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FACTORY LETTERS

Why the cost dip?

Dear Sir:

The cost index of plant maintenance in the September 1960 issue of FACTORY reports a 9.1-point dip in the price index of bearings.

We have experienced some reductions in the price of certain bearings, but not an across-the-board dip of 5.53%, which was indicated.

L. H. Finley
Manager, Engineering Equipment & Supplies Dept.
Purchasing Div., The B. F. Goodrich Co.
Akron 18, Ohio

► **Our price index for bearings is based on the Bureau of Labor Statistics wholesale price index for steel balls, chrome alloy (code number 114931). These are not complete sets of bearings, retainers, races.**

If you find that the price reduction reported by the BLS is larger than the price reductions you have experienced, it may be that the BLS sample came from a different geographical area.

Our index numbers represent a national average rather than a price in a particular market.—ED.

Panels switch with pipes

Dear Sir:

The illustration for the item on Kalwall translucent panels in FACTORY's Materials News in the August 1960 issue was mixed up with another item. Under "203—Translucent Building Panels" you have used the photograph belonging to item "210—Glass Fiber Duct Liner," and vice versa.

William C. Jewett
Advertising and Public Relations
Kalwall Corp., Manchester, N.H.

► **Many thanks for calling this error to our attention.—ED.**

Articles spur program

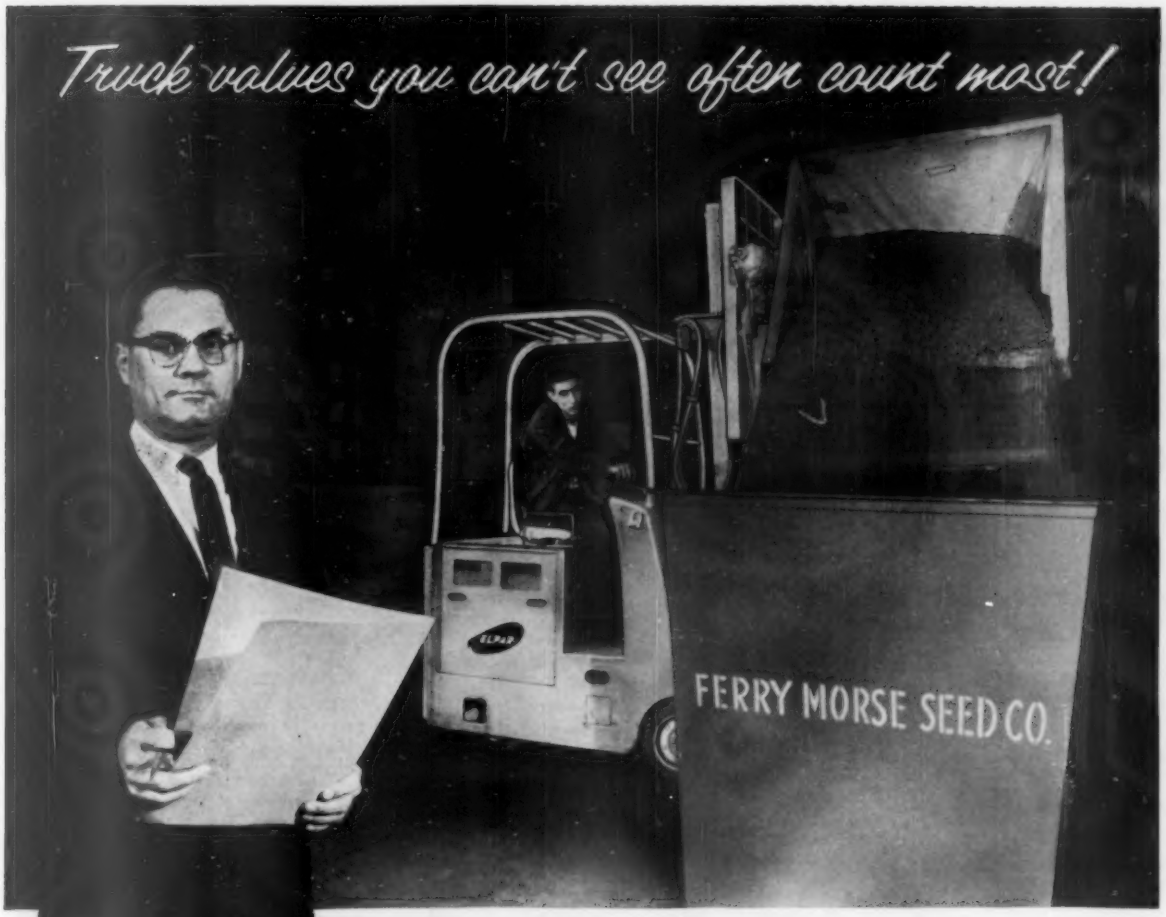
Dear Sir:

I have two of your articles on preventive maintenance which we are circulating among our personnel ("Preventive Maintenance," FACTORY, September 1956, and "This PM Program Fits Anywhere," January 1959). I feel the articles will be of great help to us in trying to set up a program here at Pitney-Bowes. Naturally, we are planning to start in a very small way, but we hope that in the future our program may become plant-wide.

Fred A. Groesbeck
Manager of Properties, Pitney-Bowes, Inc.
Stamford, Conn.

► **Reprints of these articles have sold over 10,000 copies since they've been on our shelves. They are still available.—ED.**

Turn the page



CHARLES BURGY
San Francisco Service Engineer

Ferry-Morse proved it in the case of the CANTANKEROUS CONTAINER

To cut handling costs, Ferry-Morse Seed Co. in Mt. View, California introduced a new bulk handling system for transporting and storing seed. Although the system proved sound, the method of handling posed a problem.

Ferry-Morse plant maintenance man, Charles Schembri called in Charles Burgy local ELPAR service engineer and together they developed a way to add a hydraulic rotating unit to their existing trucks. Now containers are rotated and dumped, eliminating the troublesome dumping method previously used. Result: the system has been operating dependably ever since . . . and, as always, there was no charge for the ELPAR assistance.

This case illustrates the point—*values you can't see often count most!* These ELPAR trucks not only proved versatile enough to meet a change in handling procedure . . . but Elwell-Parker is one company who is genuinely interested in helping customers find better handling methods . . . sometimes long after a truck has been sold.

If you want the most for your money—a top quality truck plus extra values like these—make your next truck an ELPAR!

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Leading producer of electric powered fork, platform and crane trucks

Killing blow! It takes only minutes for fire to burn your business to a crisp. Guard against the danger of a crippling flammable-liquid fire (as in the spray booth above) with a *fully automatic* Kidde carbon dioxide extinguishing system. Approved by U.L. and F.M., Kidde systems smother flammable-liquid and electrical fires in seconds, leave no mess, turn off power and sound alarms... get you back in production fast. Kidde's 35 years of experience can help you protect any hazard. Write Kidde today and find out how.

Kidde

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Walter Kidde & Company, Inc.
1232 Main St., Belleville 9, N. J.
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Montreal — Toronto — Vancouver

Author and critics

Dear Sir:

My warm thanks for the piece in FACTORY about my book (August 1960, page 84). You certainly have done a remarkable job in capturing the essence of my argument in brief compass, and I am most appreciative.

Douglas McGregor
School of Industrial Management
Massachusetts Institute of Technology
Cambridge, Mass.

Dear Sir:

Congratulations on your August issue. Your cover story, "Controlled Plant Information" (page 61), will be our guide if and when we think of installing computers. Your review of Douglas McGregor's book, The Human Side of Enterprise, has cleared up everything I could not understand.

Walter Sutton
Rio de Janeiro, Brazil

Dear Sir:

We were very much interested in your August cover story. It was an excellent, timely presentation of major importance to American industry. Congratulations on taking the lead in this necessary and worthwhile educational process.

Alfred B. Cramer
Section Head
Systems and Procedures Dept.
Raytheon Co.
Wayland, Mass.

Turn the page

FACTORY welcomes opinions and suggestions from its readers. They help us put management problems in better perspective. Letters should be addressed: The Editor, FACTORY, 330 West 42nd St., New York 36.

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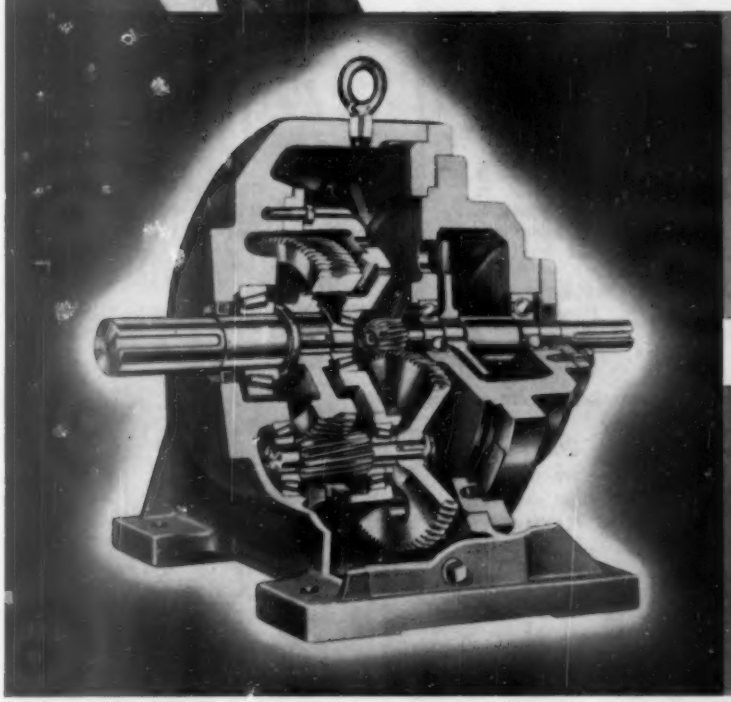
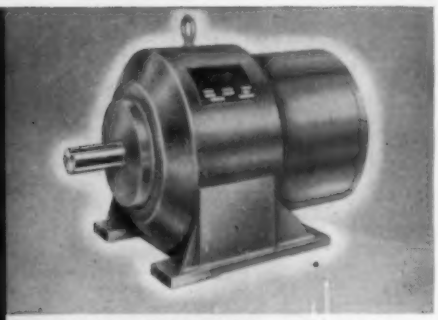
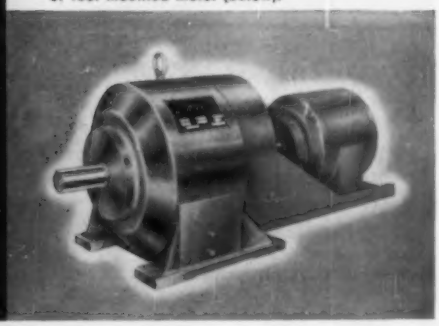
"Buying at Philadelphia Gear, I get the benefit of this simple formula..."

IMPROVED GEARS = [LONGER LIFE / MORE POWER]





Available as "IN-LINE" Reducer (left), or as a GearMotoR with flange mounted motor (above) or foot mounted motor (below).



The gearing in these drives is case hardened and precision ground, an advanced development that out-dates conventional standards and ratings. You get commercial drives with gearing of master gear quality at a cost no greater than conventional drives now in use. They are available in standard sizes to 200 H.P.

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Extreme accuracy of tooth profiles, profile spacing and surface furnish eliminates "running-in" wear.

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Reduced load factors also mean less space and weight without sacrificing performance characteristics.

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For applications where low sound levels are important, gear noise is no longer a controlling factor.

FOR MORE INFORMATION
Send for our new Catalogs R-60 (IN-LINE Reducers) and GM-60 (GearMotoRs).

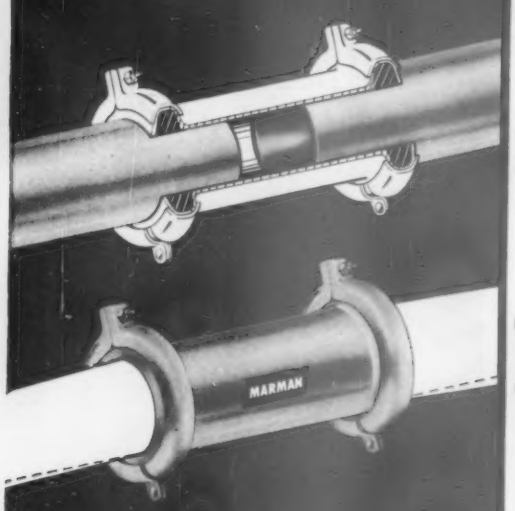
philadelphia gear drives

PHILADELPHIA GEAR CORPORATION

King of Prussia (Suburban Philadelphia), Pennsylvania

For more facts Circle 389 on Reader Service Card

Use MARMAN FLEXMASTER to Simplify Pipe Connections



WIDE RANGE OF STYLES AND SIZES

Crosses

Tees

Many Lengths

45° & 90° Elbows

Marman FLEXMASTERS are designed to join pipe quickly without cutting or threading. The illustration above shows how the easy-to-remove hinged couplings grip the pipe securely, yet absorb vibration, shock and minor axial and angular misalignment without leakage. FLEXMASTERS are available in lengths from 2″ to 36″, for pipe sizes from 3/8″ to 4″. For complete information on this and other Marman products, return the coupon for new product bulletins.

PATCHMASTER stops pipe leaks permanently, conforms to any pipe contour, sizes for ½″ to 24″ pipe.

New Marman Hose Clamp adjusts to a wide range of hose sizes, installs quickly, stays tight. With no perforations through band, there can be no extrusion of rubber to cause damage to hose.

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☐ FLEXMASTER
☐ PATCHMASTER
☐ Hose Clamp

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Title_____
Company_____
Address_____
City_____ Zone_____ State_____

Industrial friend retires

Dear Sir:

I am retiring from active duty in a few weeks and will have no future contact with industrial operations. So I'll no longer be receiving FACTORY.

During my years as a subscriber, I found your magazine extremely interesting and helpful.

I might add that National Safety News has benefited in many ways from my subscription. FACTORY influenced, to a great extent, the format of our magazine. And we found in it plenty of good ideas.

We have also gnashed our teeth many a time when you beat us to a good safety story.

Carman Fish
Editor
National Safety News
425 North Michigan Ave.
Chicago 11

FACTORY

December 1960 Vol. 118, No. 12

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a boat manufacturer did ... Now, packing boats in stapled corrugated cartons takes half as long as nailed crates and the reduced weight cuts freight costs.

PROVE

TO YOUR SATISFACTION IN YOUR OWN SHIPPING ROOM THAT BOSTITCH STAPLING SAVES TIME, MONEY AND SPACE, AND REDUCES DAMAGE CLAIMS

a ski manufacturer did ... It takes only 2½ minutes to pack a pair of skis compared with 7½ minutes by the old method—stapling is 3 to 4 times faster. For ski accessories, the company changed from wooden boxes to stapled cartons — transportation costs were cut 50 per cent and packing time 75 per cent.

a water fountain manufacturer did ... And production went up to a carton a minute compared to one every five minutes with nailed wooden cases. A 55 per cent decrease in damage claims and an 18 to 20 pound decrease in shipping weight plus a saving of 1900 cubic inches in size helped increase profits.

an oil-heater manufacturer did ... By putting ton-and-a-half oil heaters in Bostitch-stapled cartons, packing costs were cut 50 per cent and freight costs also reduced. Shipments have been completely damage-free.

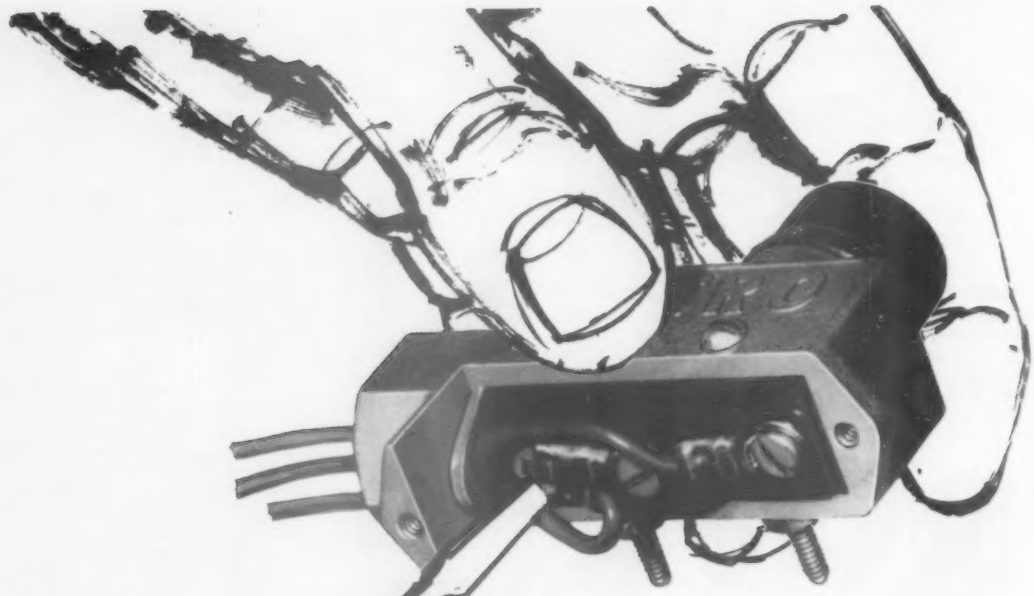
a cosmetics manufacturer did ... And box assembly time was cut in half. Result: four-tenths of a cent a unit was saved. Only 2 staples are required for most of the 28 different size boxes this manufacturer uses.

Call the Bostitch Economy Man for an in-plant demonstration in your shipping room. He can prove—with your own personnel—that Bostitch in your plant will improve shipping operations. He's listed under "Bostitch" in your phone book.

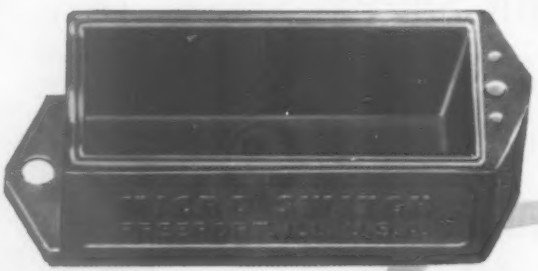
Fasten it better and faster with

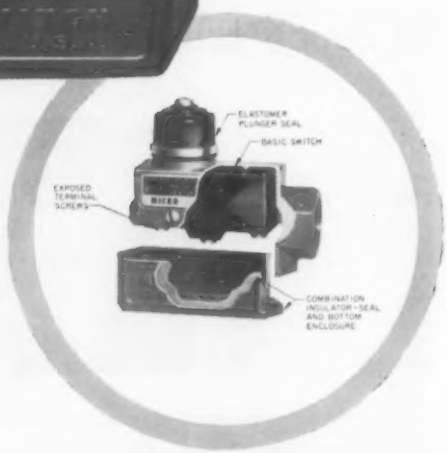
BOSTITCH®
STAPLERS AND STAPLES

612 Briggs Drive, East Greenwich, Rhode Island



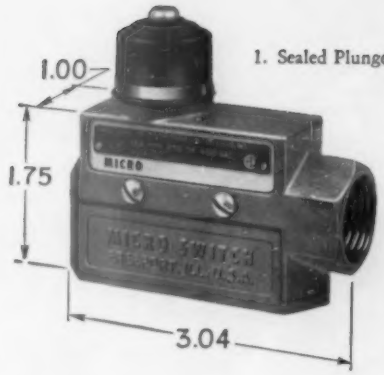
So Easy to Wire.....





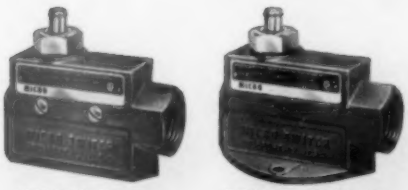
Time savings resulting from quick, easy wiring make MICRO SWITCH "E6" enclosed switches the standard for more and more industrial applications. The rugged die-cast housing is specially designed to open so the terminals are easily accessible for wiring. A hex-shaped conduit hub also makes installation easier.

"E6" switches have a combination insulator-seal permanently cemented into the bottom half of the housing to eliminate separate handling and possible loss or wrong installation of unattached gaskets. They are sealed against dirt and oil splash, and the basic switches are replaceable. See the Yellow Pages for the name of the nearby MICRO SWITCH authorized distributor or branch office and check the savings "E6" switches can yield in your plant.



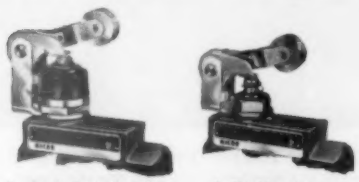
1. Sealed Plunger

....“E6” Enclosed Switches



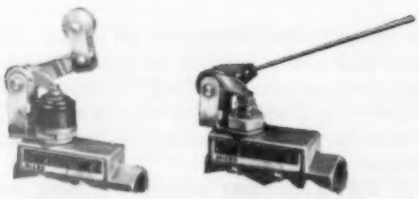
“E6” Side-Mount “V6” Bottom-Mount

2. Both Shown With Overtravel Plunger



3. Sealed Roller Arm 4. Roller Arm

5. Roller Plunger 6. Cross-Roller Plunger



7 One-Way Roller Arm 8. Rod Actuator

Side-Mount and Bottom-Mount Models —Choice of 8 Actuators in Each!

These easy-to-wire switches are available in both side-mount models (“E6”) and bottom-mount types (“V6”). Both series offer a choice of eight different actuators, a wide range of operating characteristics and contact arrangements.

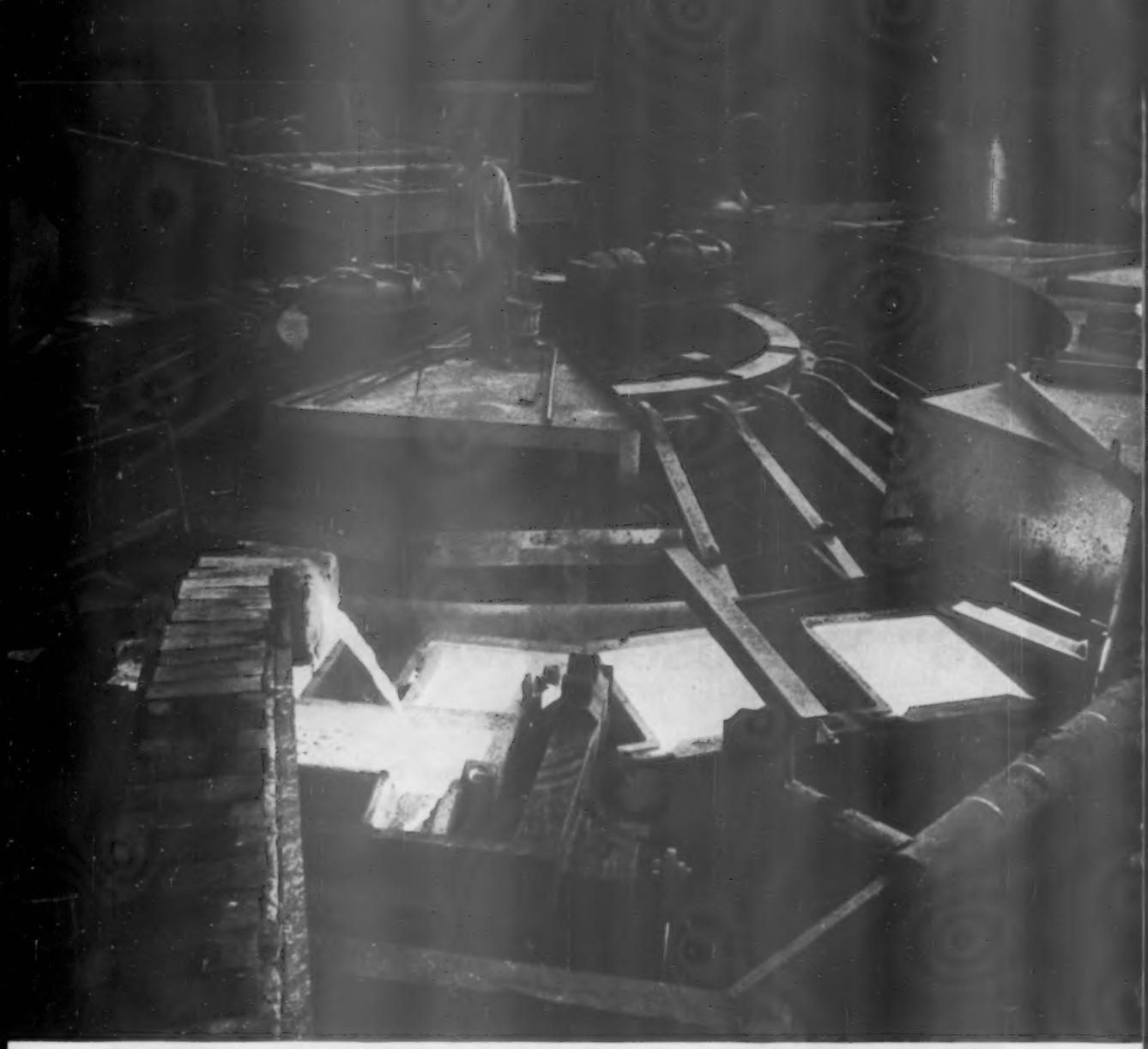
The dimensions of the rugged die-cast housings for “E6” and “V6” switches are the same as MICRO SWITCH “E” and “V” Series switches. This feature makes them interchangeable. Ask your MICRO SWITCH Authorized Distributor to show you the difference. He stocks a full line of enclosed snap-action switches and, because of his nearby location, can bring you important savings by avoiding down time on your production line.

Write for Catalog 83

MICRO SWITCH . . . FREEPORT, ILLINOIS
A division of Honeywell
In Canada: Honeywell Controls Limited, Toronto 17, Ontario

Honeywell
MICRO SWITCH Precision Switches

75 YEARS HONEYWELL PIONEERING THE FUTURE



Anode casting wheel. Here, molten copper arrives at 2100°F., and is cooled to less than 1500°F. in equipment at right. Gulf Pydraul is used in all hydraulic applications close to open flames or extreme heat. It's noncorrosive and fire resistant. Gulf Harmony lubricates wheel rollers. And Gulf E.P. Lubricant keeps the reduction gears in excellent condition.

Protects multi-million-dollar facilities against heat, sludge

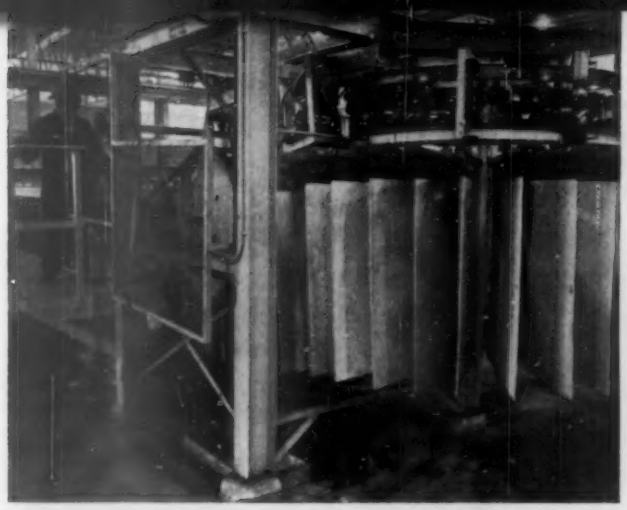
GULF MAKES THINGS

The Kennecott Refining Corporation, Ann Arundel County, refines blister copper. It has invested over 30 million dollars in highly advanced production, quality control and materials handling equipment. Work force: 600 strong. So that's $50,000 worth of equipment per man.

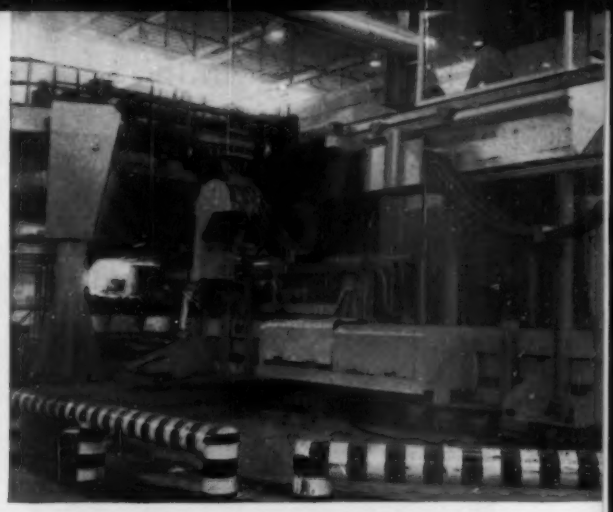
This heavily automated refinery demanded a simple, yet effective lubrication program. To set it up, the Kennecott maintenance staff worked closely with Gulf engineers. The result: a program that requires only a small number of Gulf oils and greases.

For instance, Gulf Harmony® oil is used in hydraulic systems that aren't exposed to extreme heat—assures smooth performance. And Gulf Harmony proves effective in other applications that require an oil with oxidation stability, water separation characteristics and sludge resistance.

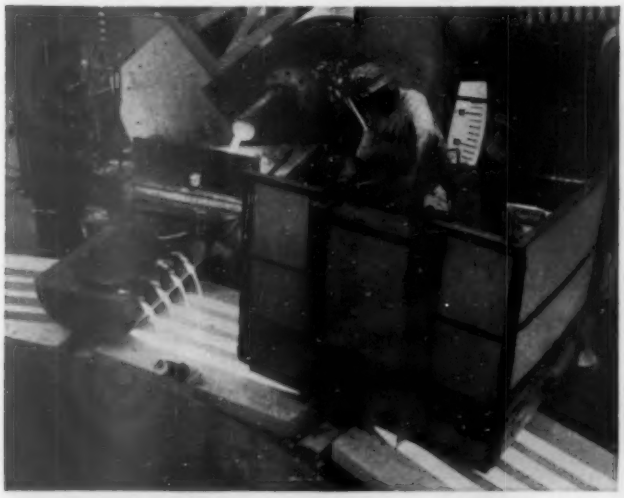
Gulf E.P. Lubricants prevent excessive wear, keep maintenance costs low on equipment that undergoes shock loads and high pressures. Example: reduction gears on anode casting wheel and furnace chargers. A Gulf Sales Engineer reports that "The anode casting



Stripper conveyer. Pulleys and gears are sprayed with Gulf Harmony 76. It's foamless. It's stable. And it provides effective protection against fumes from the electrolytic cells.



Charging machine. It feeds pre-heated cathodes to the 90-ton, 13,500 KVA electric melting furnace. Gulfcrown Grease E.P. is used in the central lube system of all furnace chargers and the rotary pre-heating furnace. It's oxidation-stabilized and protects against rust.



Wire bar casting wheel. The refined molten copper comes from a small induction furnace off the main arc furnace. Gulf Lubcote lubricates the rim gear, drive pinions and guide rolls. And Gulfcrown Grease lubricates the flexible couplings and mold tipping rollers.

Left to right. F. A. Gaidis, Plant Engineer, H. E. Nelson, Machinist Supervisor, and J. E. Foos, Gulf Sales Engineer. A small number of multi-purpose Gulf oils and greases gives the Kennecott Refining Corporation a simple, yet effective lubrication program.

and wear with just six Gulf® lubricants...

RUN BETTER!

wheel's entire system was recently cleaned, and all reduction gears were in fine shape. No dirt or rust, or any indication of oil breakdown."

Gulfcrown® Grease E.P. is also specified for equipment that meets high pressures and shock loads. Gulf Lubcote® cushions gear-teeth sliding and rolling action on open gears. Reduces noise and wear. Finally, Kennecott uses Gulf Pydraul for hydraulic applications near open flames or high temperatures, and uses Gulfcrown Grease in a variety of conventional grease applications.

May we have the opportunity to work with you in setting up a similar money-saving lubrication program with multi-purpose Gulf lubricants? They'll help you cut maintenance costs and simplify lubricant application, storage and handling. Call a Gulf Sales Engineer at your nearest Gulf office. Or write for information.

GULF OIL CORPORATION
Dept. DM, Gulf Building
Houston 2, Texas

GULF®

For more facts Circle 393 on Reader Service Card

ALLIS-CHALMERS

Imagine! A package this small

contains the spare parts for your Ro-Flo compressor

A spare parts kit you can hold in your hand — dramatic evidence of the continuous, trouble-free performance that is yours with a *Ro-Flo* compressor.

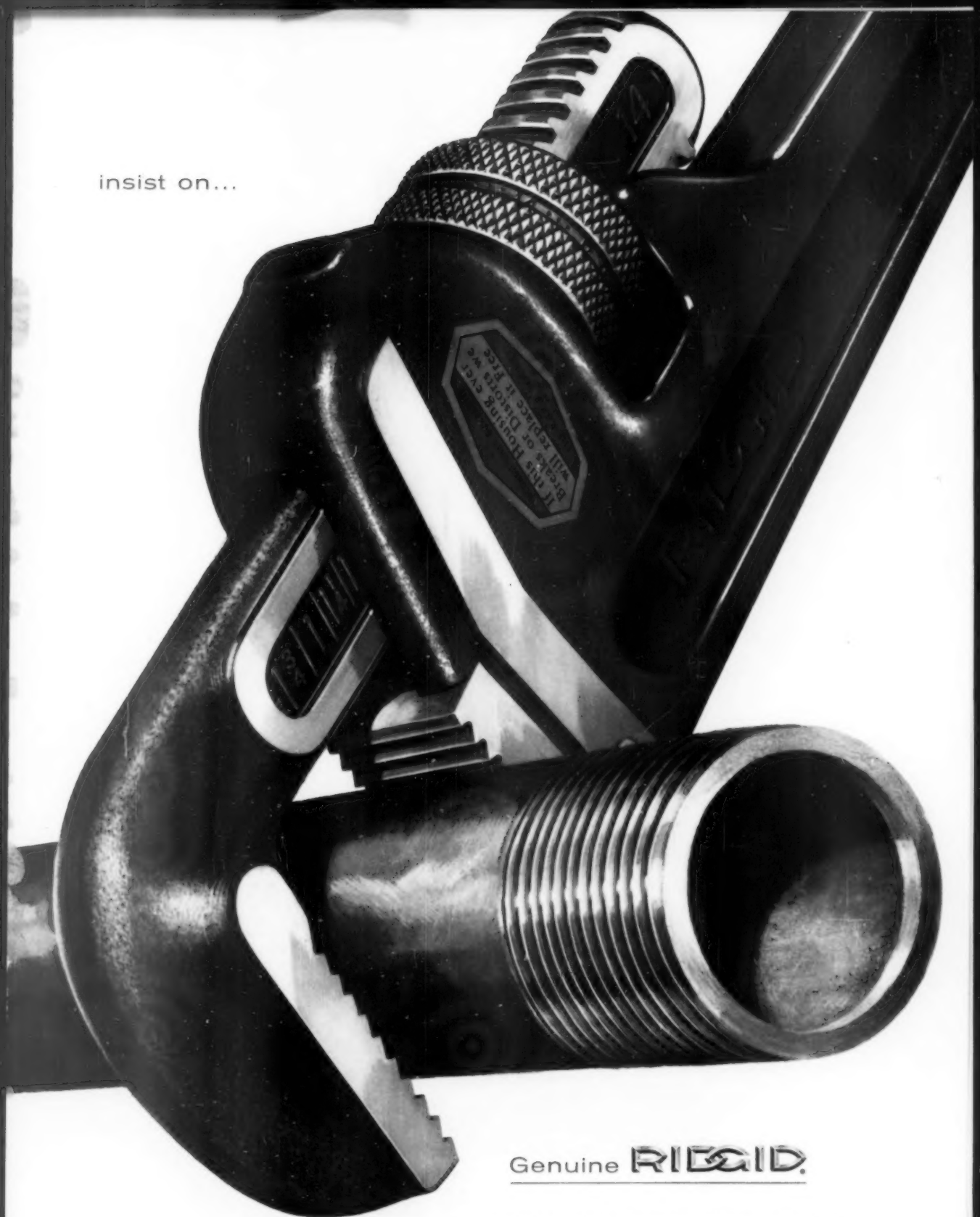
You need fewer spare parts because there are fewer moving parts to wear out. No pistons, no valves, no connecting rods. Besides the bearings and seals, which all units have, only the rotor blades are exposed to normal wear, and rotary design compensates for it — automatically, by centrifugal force. Average blade life is two to three years, and when finally worn, blades can be replaced in one simple operation.

Smooth rotary motion of the *Ro-Flo* compressor eliminates the vibration and pounding shock of reciprocating units — and the necessity for expensive, heavy foundations. A slab is enough. Smaller units can be mounted directly to the floor.

Two-stage *Ro-Flo* compressors are built in twelve sizes to handle from 250 to 1800 cfm at pressures from 60 to 125 psig. Single-stage units up to 50 psig, from 40 to 3000 cfm. *Ask your A-C representative for descriptive literature, or write* **Allis-Chalmers,** *Industrial Equipment Division, Milwaukee 1, Wisconsin.* A-1270

For more facts Circle 394 on Reader Service Card
For more facts Circle 395 on Reader Service Card ➤

insist on...



Genuine RIDGID.

THE RIDGE TOOL COMPANY, ELYRIA, OHIO, U.S.A.

Another example of how

You Fill Out The Tag...

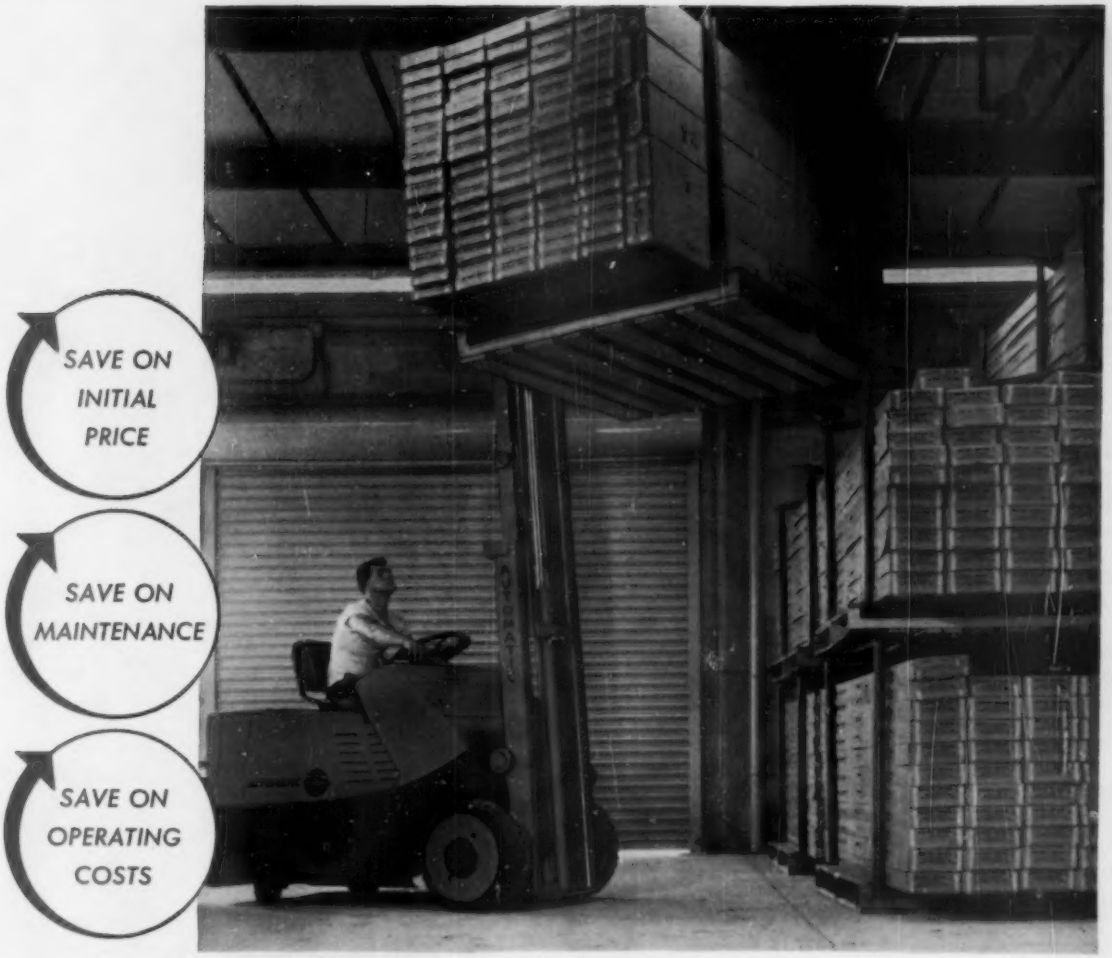
You can choose your own performance features when you order a Fenwal 536 Temperature Controller. And get them in a *compact, low-cost, transistorized stock instrument!*

Basic member of Fenwal's new "500" family, the "536" *always* provides precise control action. You merely select from the following features to meet your specific needs: 1 Proportioning or On-Off Control. 2. Five standard temperature ranges from −50 to +600°F (Special ranges, expanded scales, and centigrade scales available). 3. Dial for set-point adjustment externally or internally mounted. 4. Separate potentiometer with graduated dial and knob for remote adjustment. 5. Cartridge, hex head, flange or coupling head probe for thermistor sensor. All configurations have a rating of 10A-115VAC or 5A-230VAC. *You buy exactly what you need!*

Of course, for the user who needs most of these features, it may make more sense to order a Fenwal 561 Indicating Controller . . . with indication as a *plus*. And for multi-point indication, as many as ten 536's can be plugged in to a 580 indicator. Get catalog on the complete "500" Line. Write FENWAL INCORPORATED 2512 Pleasant Street, Ashland, Massachusetts.

Fenwal CONTROLS TEMPERATURE . . . PRECISELY

For more facts circle 396 on Reader Service Card



EASE THE PROFIT SQUEEZE WITH AN AUTOMATIC® GAS LIFT TRUCK

A truck that's down for repairs costs plenty. So does one that gulps fuel. AUTOMATIC's answer: a truck with no clutch to shift or wear out, no complicated torque converter to breakdown . . . a truck that saves you up to 30% on fuel . . . and yet costs no more to buy.

With as many as 200 fewer wearing parts compared to conventional power shift units, the danger of unexpected downtime is practically eliminated. So is the cost of complex and frequent repairs. An AUTOMATIC *gas* truck means less maintenance . . . easier maintenance.

Cutting fuel bills, while at the same time increasing output, is another profit-saver. AUTOMATIC's high efficiency transmission gives higher torque while moving more tonnage per hour with less fuel.

Check initial cost. AUTOMATIC's gas lift truck is priced competitively to all other trucks of the same capacity equipped with automatic transmission.

It's a sound formula to combat the profit squeeze: save on initial cost, save on maintenance, save on operating costs.

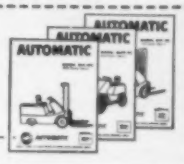
Capacity with cushion rubber tires, 3000 to 10,000 lbs., pneumatic tires, 3000 through 8000 lbs.

AUTOMATIC

AUTOMATIC TRANSPORTATION COMPANY
Division of The Yale & Towne Manufacturing Company
39 West 87th Street, Dept. X0, Chicago 20, Ill.

FIRST IN IMAGINATION
FIRST WITH REALITY

WRITE FOR DESCRIPTIVE LITERATURE
Please send full details on Automatic Gas-Operated Lift Trucks:



Name_____
Firm_____
Address_____
City_____ Zone_____ State_____

HERE'S THE POINT-BY-POINT STORY...

How General Electric designed ease of installation and maintenance, high reliability into magnetic starters

General Electric 100-Line magnetic starters help you cut the nuisance work out of inspection and maintenance. Unique design features like snap-slide disassembly (all principle components snap or slide together) let you perform all routine checks on 100-Line starters in minutes, even seconds, without tools.

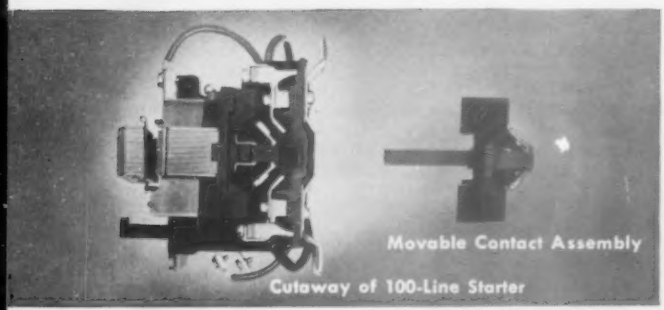
General Electric starters also give you reliable performance. All the advanced features illustrated below have been field-proved on over a million starters sold since introduction of the 100-Line.

Your General Electric Sales Engineer or distributor has more information on the MEASURABLE ADVANTAGES you get with General Electric control. Ask for Publication GEA-7020 or write to Section 813-28, General Electric Co., Schenectady, N. Y.

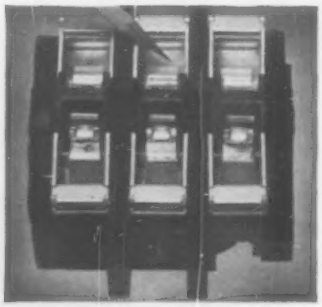
You get **MEASURABLE ADVANTAGES**
with **GENERAL ELECTRIC CONTROL**

GENERAL ELECTRIC

Only General Electric 100-Line Magnetic Starters offer



LESS BOUNCE, LONGER LIFE RESULT FROM SLANTED CONTACT DESIGN, HORIZONTAL ACTION. Bounce on closing and dust accumulation are two major causes of contact deterioration. General Electric's slanted contacts and horizontal action virtually eliminate both problems. The unique angled mating of contact surfaces provides positive "make" and "break," with less bounce, less resultant arcing. The slanted surfaces shrug off dust and other contaminants that could cause contact pitting.

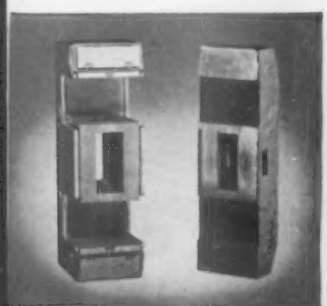


MAGNETIC STEEL ARC TRAP EXHAUSTS CONDUCTIVE GASES, REDUCES CONTACT EROSION. Size 2 starters feature arc trap which exhausts ionized gases, contains and quenches arcs. Arc trap attracts, splits and cools arcs quickly, reducing contact erosion, extending contact life.

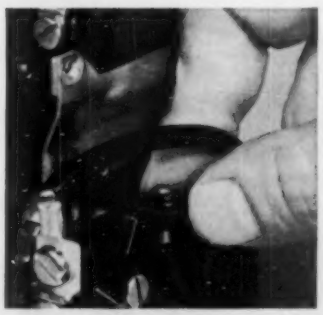
STRONGBOX MOLDED COIL PROVIDES POSITIVE PROTECTION FOR COIL WINDINGS. Glass-filled alkyd resin protects coil by preventing the flexing of coil windings; also resists dirt, oil, water, and mechanical damage.

10-SECOND CONTACT INSPECTION AND 25-SECOND COIL CHANGE is possible with G.E.'s unique snap-slide construction. Just lift off coil retainers (left) and lift out contact assembly (right) to inspect both fixed and movable contacts. To change coil, lift off retainers, remove clip and "I" magnet.

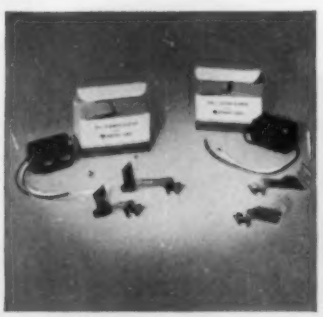
you all these features for greater reliability, flexibility



POSITIVE "MAKE", CLEAN DROP-OUT IS PROVIDED BY G-E MAGNET DESIGN. Any voltage sufficient to move magnet seats it firmly. Air-gap, short flux path reduce residual magnetism, provide clean drop-out.



BIMETALLIC OVERLOAD RELAYS ARE TRIP-FREE, ADJUSTABLE ±15%. Bimetallic relays, standard on all 100-Line starters, cannot be held closed during overload. Handy knob allows ±15% adjustment of trip setting. Overloads can be reset manually or automatically.



INDUSTRY'S MOST COMPLETE LINE OF MODIFICATION KITS GIVES FLEXIBILITY. Indicating light, selector switch, push button for cover; plus auxiliary contact, third overload relay, fuse clips, and coils can all be installed in General Electric 100-Line magnetic starters in the field.

STURDY WRAP-AROUND ENCLOSURE HAS KEYHOLE SLOT MOUNTING for simple, secure installation. Just slip the keyhole slots over screws. Screws support the starter enclosure while tightening.

For more facts Circle 398 on Reader Service Card

Controlled environment assures uniform product quality, boosts "O" ring output

Controlled thermal conditions play a vital role in the manufacture of rubber "O" rings at Lebanon Manufacturing Company, Lebanon, Tennessee, a Division of Precision Rubber Products Corporation.

A specially designed Johnson Air Conditioning Control System maintains the exact temperatures required for the various manufacturing operations as well as for the comfort of plant and office personnel. Of particular importance is the need for temperature control that permits manufacturing to extremely close tolerances.

Here, as in thousands of other Johnson-equipped plants, a controlled thermal environment results in greater productivity, more uniform product quality, and improved worker efficiency.

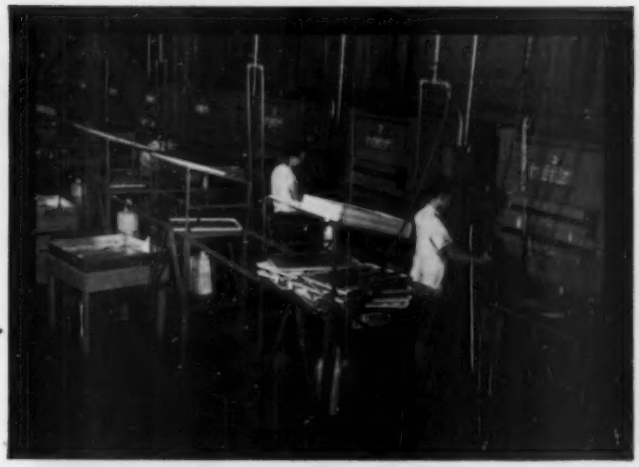
Johnson Pneumatic Control Systems are applied to all types and makes of air conditioning, heating, and ventilating equipment and to a wide range of industrial processes. Each system is engineered and installed to meet the specific requirements of the individual plant. Next time you are considering controls, investigate the advantages Johnson Control can give you — in performance, dependability, and operational savings. Johnson Service Company, Milwaukee 1, Wisconsin. 105 Direct Branch Offices.

JOHNSON CONTROL

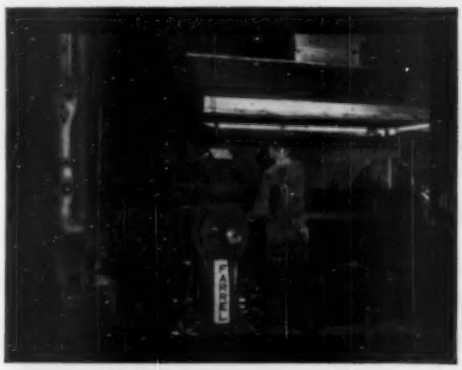
PNEUMATIC SYSTEMS

DESIGN • MANUFACTURE • INSTALLATION • SINCE 1885

Blanks for rubber "O" rings are stamped from sheet stock. Controlled air conditions are necessary to assure sharp, clean cuts.



In the press room, blanks are molded into finished "O" rings. After molding, controlled temperatures keep rings from becoming sticky and eliminate handling problems during trimming and final inspection.



To compensate for heat generated by the re-sheeting presses and to allow continuous operation, a Johnson thermostat and chilled water valve supply 40F water for the press rolls.

Lebanon Manufacturing Company, a Division of Precision Rubber Products Corporation, Lebanon, Tennessee. Schweiger, Heapy & Associates, architects and mechanical engineers, Dayton, Ohio; Henry Stock & Sons, general contractors, Dayton, Ohio; John Bouchard & Sons, mechanical contractors, Nashville, Tennessee.

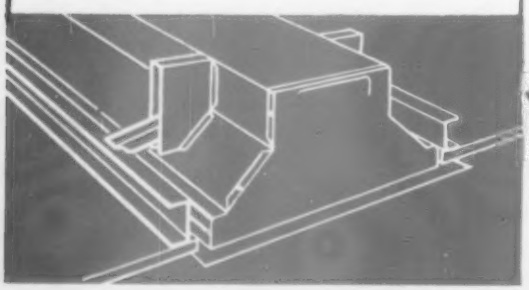
Here's a Sparkling Addition to Sylvania's Popular Troffer Series..

Newly installed Sylvania two-foot-wide Troffers with Plastic Lens shielding provide 120 footcandles of quality illumination in the home office of the National Union Fire Insurance Co., Pittsburgh, Pa.

Architect: William B. Simboli & Associates
Consulting Electrical Engineer: Carl J. Long
Electrical Contractor: J. W. Hosick

Here's What Sylvania's Troffer Line Offers You

- Only 5½" deep for ideal ballast operation and convenient relamping.
- Broad choice of widths and lengths.
- 2, 3, 4 and 6 lamp units to meet any lighting requirement.
- Concealed hinges and latches.
- Wide selection of shielding media.
- 3 housing types to fit ALL modern ceilings.
- Simple installation in any ceiling.
- Easy access for maintenance.
- 5 types of Accent Units for pattern lighting.



Sylvania's Troffer Series enjoys tremendous popularity for two basic reasons: (1) outstanding product design together with practical, time-saving features; and (2) an extremely wide range of models to fit all modern ceilings and to suit every individual taste.

Now . . . a NEW addition to the famous Sylvania Troffer family . . . the *Air-Handling Troffer* combining the functions of lighting, heating and cooling into one compact system.

Here is a unit that blends the lighting features and advantages of Sylvania Troffers with the air handling experience of The Pyle-National Company.

With Sylvania's Air-Handling Troffer you obtain the correct, controlled atmosphere so essential for top effi-

Unique Snap-Up Hanger

The simplest, most effective method of installing troffers in acoustical ceilings and in plaster ceilings with metal framing.

Fixture snaps into place and is supported by toggle arms of Snap-Up Hanger. Positioning and leveling of troffer takes only a few minutes.

ciency working performance. The coordination of mechanical facilities results in excellent overall economy. And uncluttered ceilings, free of separate diffusers, meet the goal of alert designers today.

All of the key features of Sylvania's Troffer Series are incorporated in this new fixture. The air-mixing chamber plus the valve and other air handling accessories combine for a minimum plenum chamber depth for most effective space utilization. The wide selection of fixture sizes, shieldings and number of lamps permits any lighting requirement to be met efficiently and economically.

The low-velocity air-diffusion system provides efficient, uniform air distribution for year-round comfort. Noises, drafts and soiled ceiling areas are minimized. Because the low-velocity system does not depend on walls or partition locations, room space assignments can normally be changed without affecting the efficiency or operation of the air flow.

This combination of quality lighting and efficient air-handling fits well with many building or remodeling plans. Perhaps you can use these convenient, money-saving advantages on your next project. Write today for complete information.

SYLVANIA LIGHTING PRODUCTS
A Division of SYLVANIA ELECTRIC PRODUCTS INC.
One 48th Street, Wheeling, West Virginia

SYLVANIA

Subsidiary of **GENERAL TELEPHONE & ELECTRONICS**

GENERAL SYSTEM

For more facts Circle 400 on Reader Service Card

For more facts Circle 401 on Reader Service Card ➤

NEW
CUNO
MICRO-WYND
FILTER CARTRIDGE
PART NUMBER
ACFC
THE CUNO ENGINEERING CORPORATION

You asked for a wound filter cartridge with superior performance characteristics . . . and here it is!

MICRO-WYND

. . . the outstanding depth-type, disposable filter cartridge

MICRO-WYND is Cuno's answer to the many operating headaches typical of the ordinary wound cartridge . . . because it is designed and built with absolute control of all elements affecting filtration performance.

MICRO-WYND's patented manufacturing process unites a layer of fibers of proven filter properties with a winding yarn of exceptional strength. The filter fibers, woven in and out of the winding yarn, are firmly locked in place, completely bridging each diamond-shaped fluid path. This exclusive Cuno process does away with problems of variable flow, early loading, sudden contaminant bypassing that users encounter with ordinary wound filters whose efficiency is compromised by a mere brushing of the winding yarn to raise filter fibers.

There's more to MICRO-WYND, too, than meets the eye. Graded density in depth, or ability to trap progressively finer particles from O.D. to core, is achieved by controlled dispersion of the separately applied layer of filter fibers. Strict control of winding yarn tension and method of application also gives you a cartridge that is structurally strong, that assembles in multiples without extra end sealing devices, and that stands up under the toughest operating conditions.

Get the facts *now* on MICRO-WYND . . . the all-new wound cartridge that's designed and built to set new filtration performance standards in your plant!

Send Today

FOR COMPLETE DATA

CUNO®

THE CUNO ENGINEERING CORPORATION

MERIDEN, CONNECTICUT

IN CANADA: PEACOCK BROS., LTD.
MONTREAL, P.Q.

THE CUNO ENGINEERING CORPORATION
Dept. 22, 80 South Vine Street
Meriden, Connecticut

Please send me new Data Folder—MW-100—on Micro-Wynd. The fluid I want to filter is_____

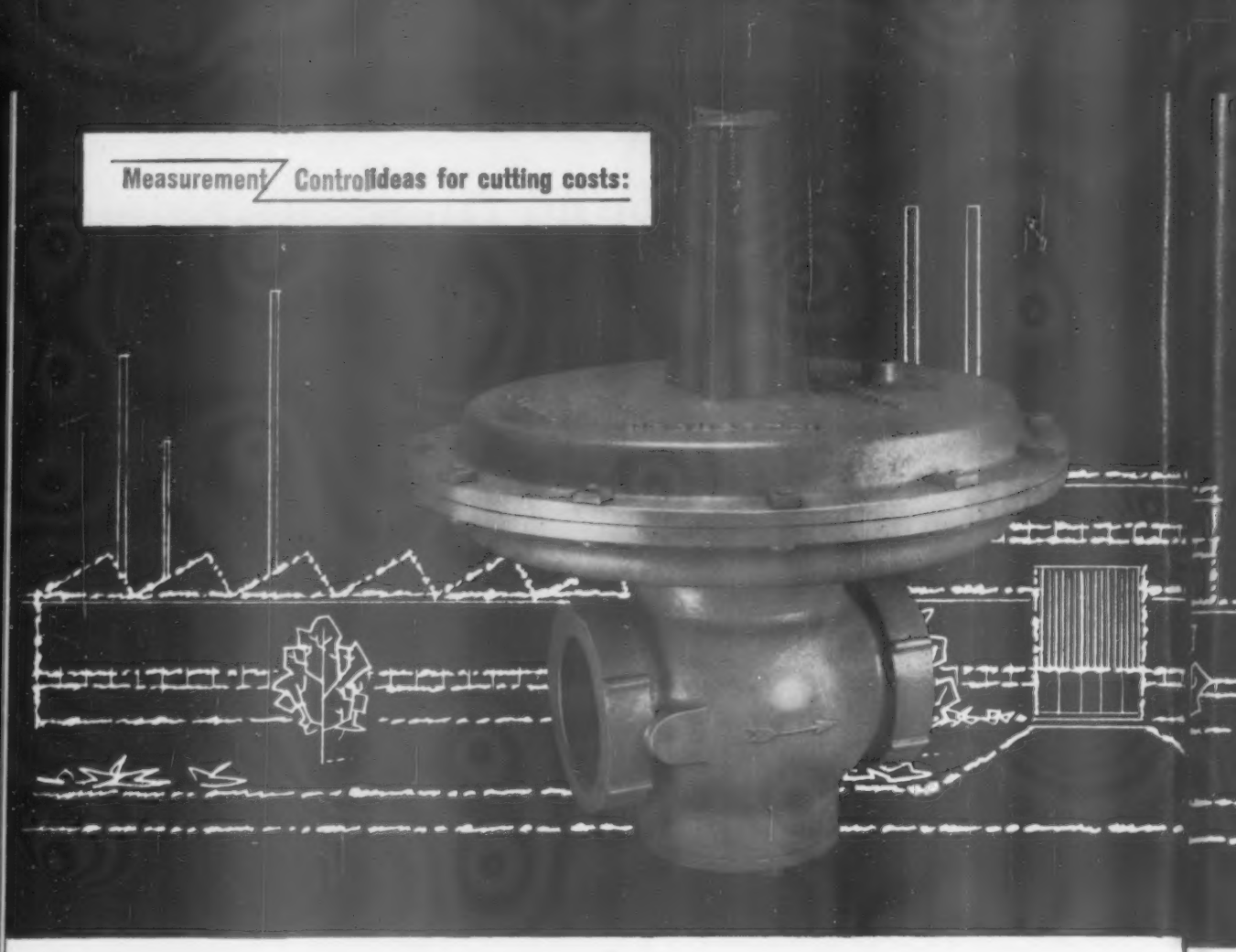
Name_____

Title_____

Company_____

Street_____

City_____



The $40.00 regulator that could have saved $30,000.00

A gas pressure regulator like the one shown above was doing a precise job of regulating fuel gas in a glass plant—until a scaffold fell on it. Without the regulator, the entire plant was out of business. Down-time cost was about $30,000.00.

The Rockwell Field Engineer who personally rushed another regulator to this customer pointed out that an extra stand-by regulator would cost only $40.00—low-cost insurance against a possible $30,000.00 loss. The customer followed this recommendation, as well as others which the Field Engineer made in the interest of more efficient handling of measurement and control functions in this plant.

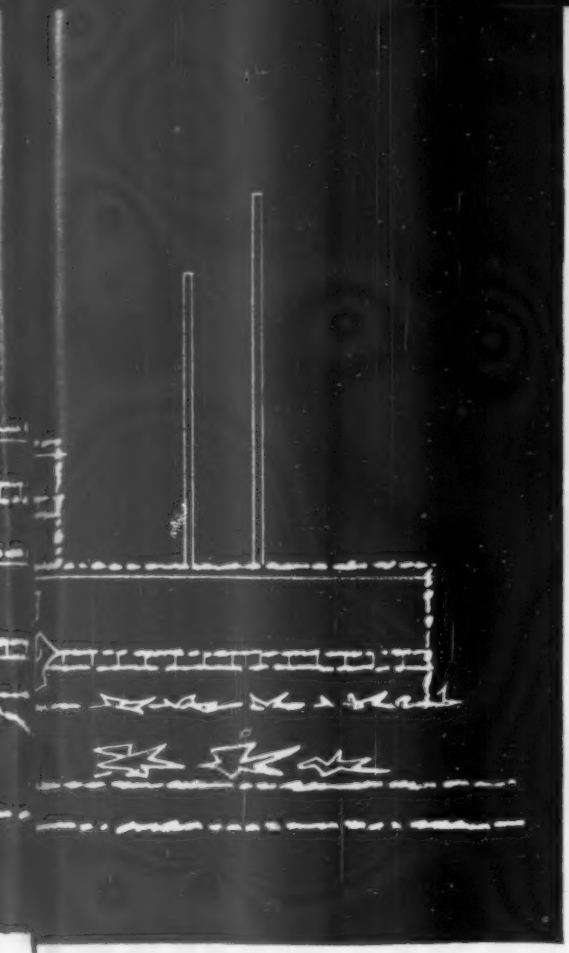
There are many ways a Rockwell Field Engineer can help *you* save time, money, and material wherever gases or liquids flow through pipe in your plant. He represents the largest and most experienced manufacturer of measurement and control products—and this experience can pay off for you. New or different uses of valves or regulators can prevent waste and inefficiency. Rockwell gas and liquid meters can measure almost anything that flows through a pipe, and can often assure big savings in time and labor, while improving quality.

It costs nothing to talk to a Rockwell Field Engineer—simply send the coupon.

ROCKWELL

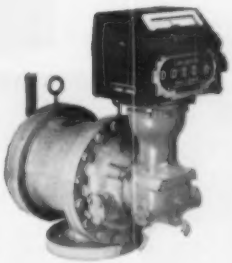
The leading single source for Measurement/Control products and ideas

For more facts circle 402 on Reader Service Card



"IN-PLANT" METERING:

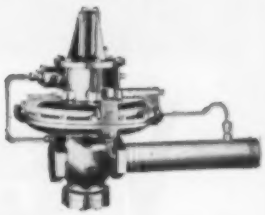
LIQUIDS AND GASES

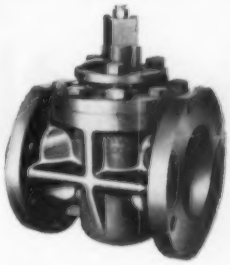


"IN-PLANT" METERING can mean new cost cutting opportunities. Accurate liquid and gas meters are a positive way of improving cost control, insuring better use of materials, sharpening inventory control, and preventing waste. Whatever the need, Rockwell has the right liquid or gas meter to do the job better and at lower cost.

CONTROLLING PIPED MATERIAL:

LIQUIDS AND GASES





CONTROLLING PIPED MATERIAL more efficiently is a positive step towards cost cutting. Better valves can save wasted products and materials and often increase plant safety. Gas pressure regulators can cut costs by assuring safe, economical use of any gas used in the plant. Rockwell has the world's most complete line of flow control devices.

HOW MUCH COULD YOU SAVE?

There is hardly a plant of any kind—including yours—where the right application of the right measurement and control methods and equipment won't produce savings many times the modest cost involved. It will cost you nothing to have a Rockwell Field Engineer *show* you. Simply send the coupon below, now.

SEND COUPON NOW!

MEASUREMENT & CONTROL DEVICES

another fine product by

ROCKWELL

Rockwell Manufacturing Company, Pittsburgh 8, Pa. MC1M

☐ Please have a Rockwell Field Engineer call me for an appointment.

Please send literature on ☐ Controlling gas pressures; ☐ Valving gases, liquids and slurries; ☐ Measuring liquids; ☐ Measuring gases.

I am concerned primarily with ☐ Light & Heavy Metal Fabricating ☐ Basic Chemical Production ☐ Chemical Processing ☐ Food, Drugs & Tobacco ☐ General Manufacturing Operations ☐ Petroleum Processing

☐ Others: _____

Name: _____ Title: _____

Company: _____

Address: _____

City: _____ Zone: _____ State: _____

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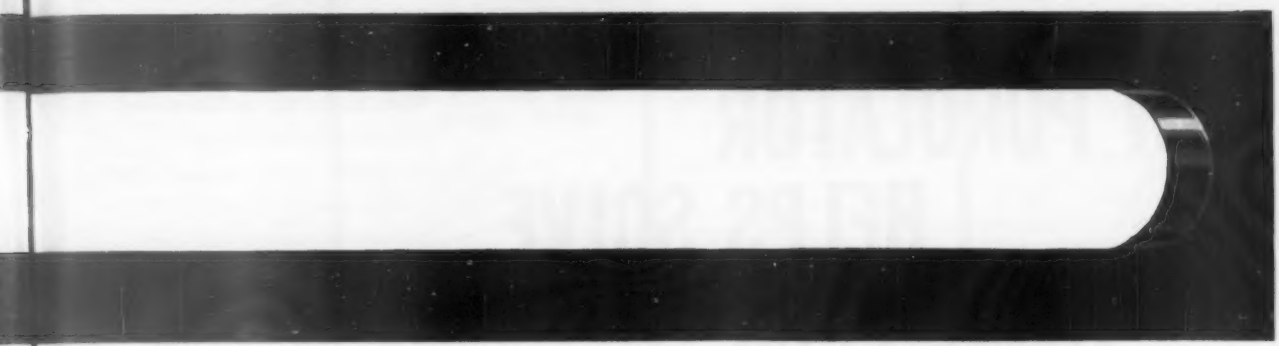
40W HIGH EFFICIENCY
PREHEAT-RAPID START
F40HE
H.E.

Westinghouse HIGH
the brightest 40-watt
lamps you

- 3200 lumens output for 40-watt lamps
- 6400 lumens output for 96" Slimline lamps
- No premium cost
- No extra cost for power
- Just snap into your present fixtures

W !



EFFICIENCY Lamps... and slimline fluorescent can buy

Now you can increase the lighting level in your factory, office, warehouse or store without changing a single fixture, without adding to power costs and without paying a premium price for the lamps.

These new High Efficiency Westinghouse Fluorescent Lamps (40-watt Universal and 96" Slimline types) give 15% more light than the cool white and 36% more light than the daylight lamps you now use. They maintain highest levels of light over their long life.

Try High Efficiency Lamps in an entire work area. If you don't agree that you get more light—softer, more comfortable light—we will exchange them for any Westinghouse fluorescent lamps of your choice.

Order new "H.E." lamps today from your authorized Westinghouse Lamp Agent or nearest Westinghouse Lamp Sales Office. You can be sure . . . if it's Westinghouse.

Westinghouse

WESTINGHOUSE LAMP DIVISION
Westinghouse Electric Corporation, Bloomfield, N. J.

For more facts Circle 403 on Reader Service Card

HOW PUROLATOR HELPS SOLVE THESE FOUR COMMON IN-PLANT FILTRATION PROBLEMS

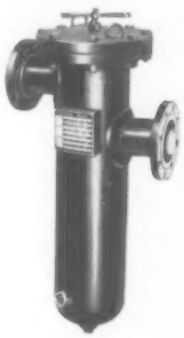
Proper filtration means reduced wear, longer life and increased efficiency for most types of machinery. It also means higher quality manufactured products because of contaminate-free process fluids.

As the world's largest, most-experienced maker of filters, Purolator has over 2,000 standard filter units available. Standard Purolator filters solve these filtration problems. Chances are, they will also solve yours. If not, Purolator will design — and make — filters that will. See your nearby Purolator distributor, or write: Purolator Products Inc., Rahway, New Jersey.

PROBLEM: Contamination of Bulk Fluids and Semi-Fluids Before Packaging. Despite rigid precautions, various contaminates can enter bulk fluids during processing. These contaminates may be: oxides from pipe corrosion; water from evaporation in storage tanks; tiny metal chips from machinery; or foreign matter picked up from the atmosphere.

SOLUTION: Purolator Model G-141J Metal Edge Filter is ideal for filtering most bulk fluids just before packaging. These fluids might include: inks, varnishes, food products, greases; process fluids, or lube and fuel oils.

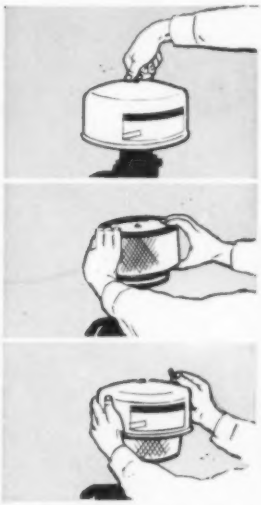
The G-141J's filter element is permanent . . . made of precisely-spaced metal ribbon wound into cylinder form. Capacity ranges from 6 to 200 GPM. Filtration . . . from 25 to 500 microns. Installation can be made on either pressure or suction side of pump. If desired, filter is also available in stainless steel.



Continuous, Permanent Filtration. Cleaning the G-141J is simple, too. No need to disassemble the unit or stop the flow of fluid. Turning handle rotates metal edge filter unit against fixed knife-blade which shears off waste. This is periodically removed through plug at bottom. If service warrants, filter element can be rotated continuously by motor drive.

PROBLEM: Air-Filter Maintenance. Removing, washing and re-oiling ordinary oil-bath type air filters is a time-consuming (and expensive) chore. What's more – this type of unit is relatively inefficient. Clogs easily and then lets abrasive-laden air into the engine.

SOLUTION: Purolator Micronic filter elements can be replaced in seconds. Special accordion pleating means 9-14 feet of filter area – 10 times that of most competitors. Controlled porosity filters out particles as small as .000039 of an inch. Models up to 1,000 CFM available.



Service in Seconds. Here's all you do to service a typical Purolator Dry Type Micronic Air Filter:

1. Loosen wing nut. Remove cover and dirty refill.
2. Replace with a new Purolator Micronic refill.
3. Replace cover and tighten wing nut.

Purolator refills are inexpensive. However, filter element life can be extended by cleaning. This is done by applying reverse flow of low pressure air through element.

PROBLEM: Incomplete Filtration of Lubricating Oil. Various bleeder, bypass, shunt and similar partial flow systems often used on machine tools and large engines can cause damaged parts and excessive wear because contaminates are permitted to pass into the engine.

SOLUTION: A Purolator Micronic Filter of correct size can handle full lubricating oil flow for even the largest engines. The protection this kind of filter gives the engine exceeds anything a partial flow arrangement could accomplish.

Full-flow lube oil filtration. Pictured above is a typical Purolator Micronic Filter, Series P-32.

PROBLEM: Diverse Filter Requirements of Hydraulic Circuits. Without proper filtration, most hydraulic circuits would soon break down. Yet even a small plant has many different hydraulic circuits – each one requiring a specific type of filter.

SOLUTION: Purolator's complete line of filters for hydraulic systems is the most comprehensive of its kind. Models include: suction strainers to protect pumps; high-pressure filters to protect delicate control valves; and low-pressure filters for return circuits.

Complete line of filters for all hydraulic circuits. Here are just a few standard units. Filter media include: Micronic, metal edge and wire cloth.

Filtration For Every Known Fluid

PUROLATOR
PRODUCTS, INC.
RAHWAY, NEW JERSEY AND TORONTO, ONTARIO, CANADA

For more facts Circle 404 on Reader Service Card

NO "NEW IMAGE" FOR US, THANKS

Seems nowadays practically everyone talks about "changing the image," "creating a new corporate image" or "giving the product a more dynamic image."

There's no such talk around Jenkins Bros.

When it comes to valves, we're as modern as tomorrow! But when it comes to a new corporate image, no thanks. Not for us. Our corporate image is nearly 100 years old, and it still suits us just fine. Here's why:

We'll Keep our Old, 1869-Model "Image" – Our Business Friends Seem to Like It

"A Fair Offer" was first published in 1869. Simple and forthright, it said that Jenkins Bros. wanted Jenkins Valves to be judged on performance. But — and this made the difference — not on performance in the average application, but rather in the very toughest one. Note that phrase, "the worst place you can find."

To us, it just naturally figures that the product which asks for the hardest job, will also be better, longer lasting and more trouble-free in regular, run-of-the-mill applications. Makes sense, doesn't it?

At intervals we republish "A Fair Offer" just because it does make sense to so many of our customers and friends. It's a useful reminder that products may change but *high standards* never go out of style.

JENKINS®

Jenkins Bros

Jenkins Bros., 100 Park Avenue, New York 17

A FAIR OFFER

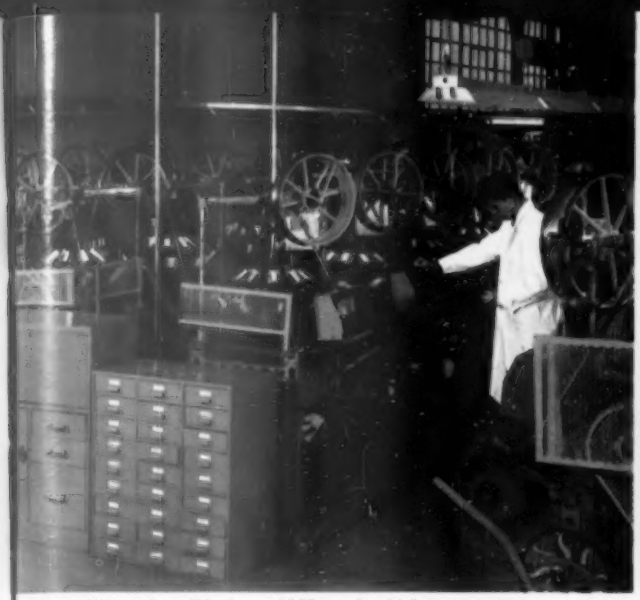
If you will put a Jenkins Valve, recommended for your particular service, on the worst place you can find . . . where you cannot keep other valves tight — and if it is not perfectly tight or it does not hold steam, oil, acids, water or other fluids longer than any other valve, you may return it and your money will be refunded.

Jenkins Bros

This early Jenkins Catalog carri[ed] the famous A FAIR OFFER which has appeared in every catalog since 1869.

For more facts Circle 405 on Reader Service Card

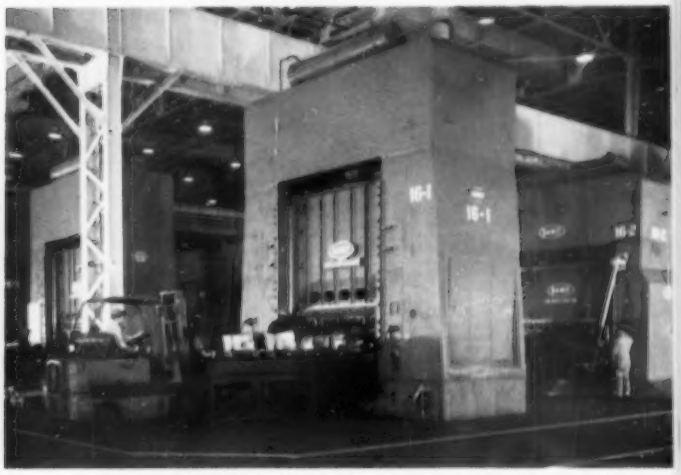
For more facts Circle 406 on Reader Service Card ➤



Hitemp Wires, Inc., Westbury, N.Y., makes high-temperature insulated wires and cables for aircraft and missiles fields.

Graflex, Inc., Rochester, N.Y., produces photographic and electronic equipment of unusual versatility and reliability.

Hankins Container Company's Cleveland, Ohio, plant fabricates corrugated paper shipping cases and paper containers.



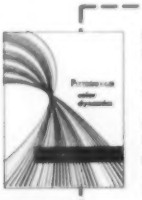
Chrysler Corporation's huge stamping plant in Twinsburg, Ohio, manufactures metal body parts for its many motorcars and trucks.

Pittsburgh COLOR DYNAMICS® helps to increase productive efficiency in a wide range of industries

- **Improves working conditions**
- **Lessens eyestrain and physical fatigue**
- **Enhances morale of employees**
- **Reduces hazards of time-loss accidents**

• **Many hundreds of industrial plants** all over America use Pittsburgh COLOR DYNAMICS to improve productive efficiency and well-being of their workers. These industries range from textile and paper mills to factories making motorcars, farm tractors and airplanes. By following the principles of this modern painting system, work areas are made more pleasing. Workmanship and productivity are improved. Safety colors on controls, motorized equipment, cranes and traffic lanes reduce danger of accidents. And COLOR DYNAMICS assures these benefits at no greater cost than conventional maintenance painting.

Send coupon for free copy of booklet which explains what COLOR DYNAMICS is and how it can be applied. If you wish, we'll also gladly prepare a detailed color plan of your factory without cost or obligation.



Pittsburgh Plate Glass Co., Paint Div., Department F-120, Pittsburgh 22, Pa.

☐ Please send me a FREE copy of your booklet "COLOR DYNAMICS."

☐ Please have your representative call for a COLOR DYNAMICS survey without obligation on our part.

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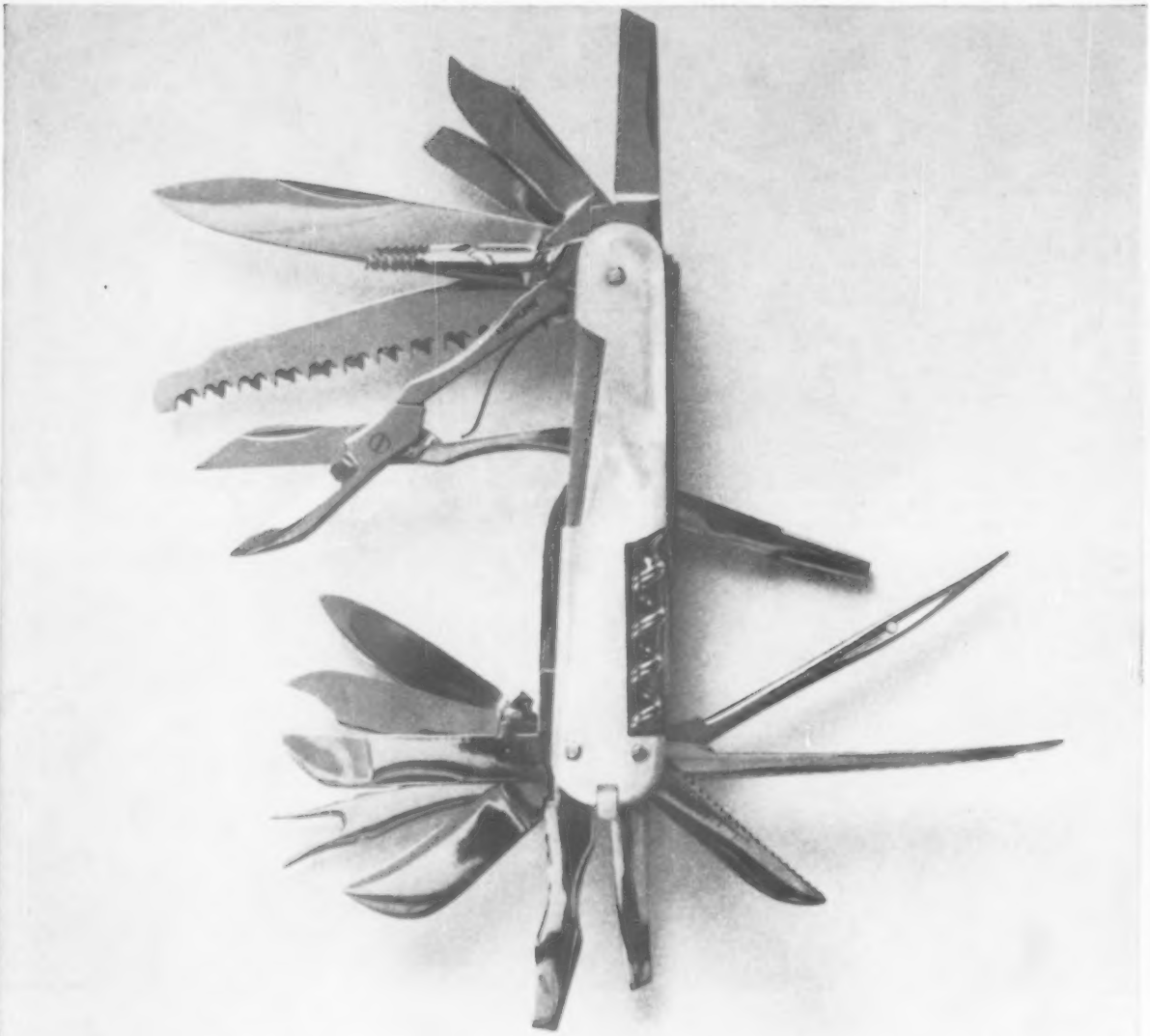
PITTSBURGH PLATE GLASS COMPANY



VERSATILE

Here you see an ingenious collection of tools. Yet this superb combination knife cannot compare with INLAND 4-WAY SAFETY PLATE in versatility of performance. In fact, when it comes to describing the range of uses for easy-to-fabricate INLAND 4-WAY, there seems to be no limit.

Users tell us they especially like 4-WAY's versatility made possible by its 3 different raised-lug patterns—small, medium and large; by its 15 different gages from 18 gage up to ¾" thickness; by its range of weights from 2.4 pounds to 31.65 pounds per square foot; and by its availability in widths from 24" all the way up to 72". *For shop use, fleet maintenance, as a basic material in the fabrication of products, as a structural building material, 4-WAY is ideally useful. Write today for your copy of Inland's 4-WAY Safety Plate Booklet.*

available from your steel service center

INLAND 4-WAY® SAFETY PLATE

INLAND STEEL COMPANY
30 W. Monroe St. • Chicago 3, Ill.

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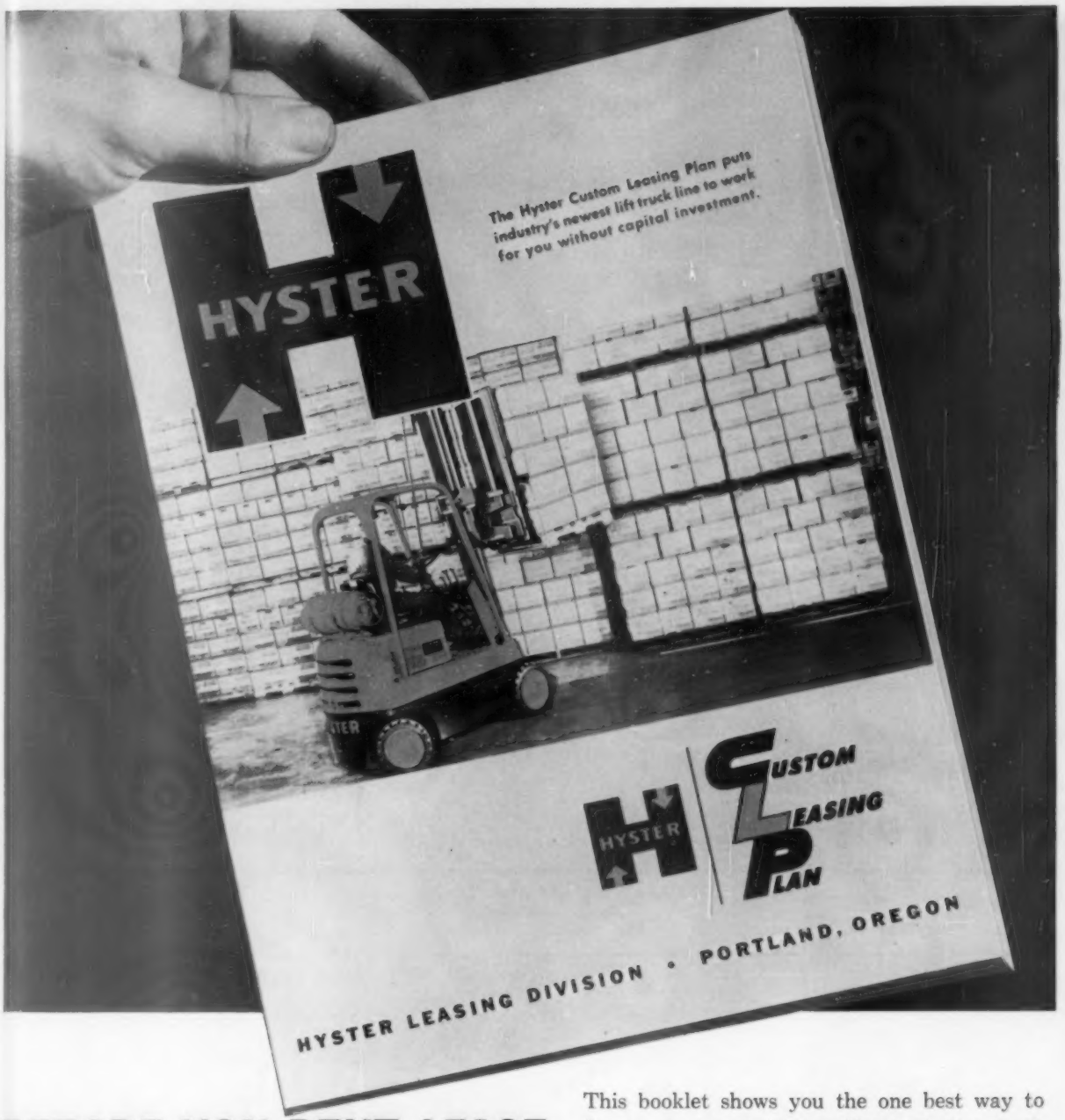
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The Hyster Custom Leasing Plan puts industry's newest lift truck line to work for you without capital investment.
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Read this Booklet!

This booklet shows you the one best way to finance your material handling fleet. One truck or 50 trucks – one day or 5 years – this Custom Leasing Plan fits your exact requirements.

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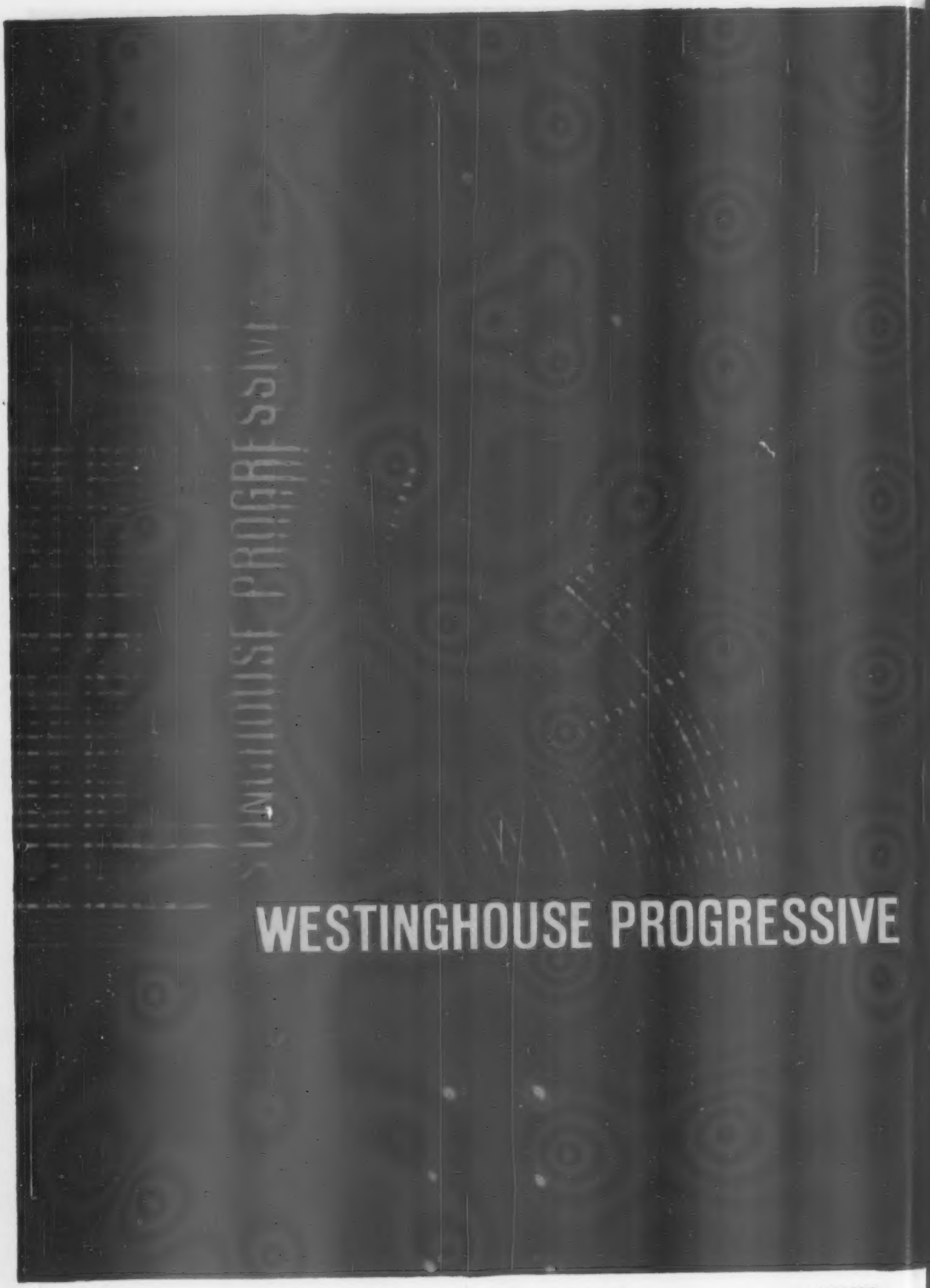

WESTINGHOUSE PROGRESSIVE

WESTINGHOUSE PROGRESSIVE AUTOMATION CAN HELP YOU IMPROVE OUTPUT, PROFITS THROUGH COORDINATED AUTOMATIC PRODUCTION

AUTOMATION

Westinghouse *Progressive Automation* is a long-term plan leading to automated production with minimum capitalization. It is designed to help manufacturers gain better product quality through step-by-step control of operations.

In fact, *Progressive Automation* has already been carried to its logical conclusion: completely automatic production. In the steel industry alone, three computer-controlled systems have been sold. Here the entire drive systems, supplied by Westinghouse, provide coordination of rolling mill operations under the command of a computer.

AUTOMATION... STEP BY STEP—Westinghouse is ready to work with you in planning economical steps to automatic operations . . . without under- or over-automating. Step-by-step automation starts with the many modern Westinghouse controls, motors and drives at work in plants today. Each was designed to achieve an immediate production objective . . . to control a single machine, a conveyor line or an entire installation. Through *Progressive Automation*, you next add other Westinghouse coordinating controls and systems—all of which are compatible with those already in place. Your eventual target may be all production facilities fully coordinated with the Westinghouse industrial control computer.

PROGRESSIVE AUTOMATION ALREADY AT WORK—*In the paper industry*, PULSETTER* makes possible new standards of accuracy and product quality in paper production. The PULSETTER control system uses digital circuitry to maintain accurate synchronization of the speed *and* position of all sections of a paper machine. Accuracies can be maintained to only a 5″ variation in 2000 feet of paper.

In the chemical processing industries, Westinghouse provides OPCON* which experiments, then finds and controls optimum production efficiency.

For the primary metals industry, installations of Westinghouse PRODAC* (programmed digital automatic control) have improved product quality and mill functions, as well as monitoring all phases of the product and process by data accumulation systems.

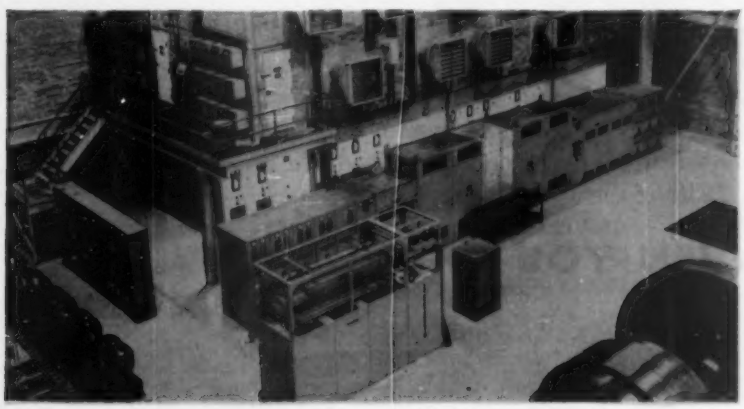
For the first time, there is now one source for all your automation needs: Westinghouse computers, controls, drive systems, transformers, motors, gearing, switchgear . . . and Westinghouse assumes full electrical system responsibility.

Call on Westinghouse and detail your objectives. We are prepared to work out your automation plan . . . furnish, install and maintain the necessary electrical equipment. Your Westinghouse representative has complete details on *Progressive Automation*.

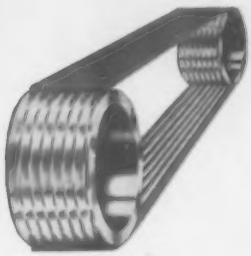
*Trade-Marks

J-96144

PRODAC control computers are designed to work in unison with conventional control equipment. Result: full automation of plant or process becomes a practical reality.



YOU CAN BE SURE...IF IT'S Westinghouse



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- COMPLETE CONTACT-PRESSURE
- CONSTANT PITCH AND SPEED RATIOS
- LESS MAINTENANCE—LESS TAKE-UPS
- LESS BELT AND SHEAVE WEAR

Write for Bulletin M141

R/M POLY-V® DRIVE

MORE POWER...*in Less Space*
WITH MORE RELIABILITY

Designed for high volume forgings, this giant 2500 ton automated press developed by Erie Foundry Company is powered by a 250 HP Poly-V Drive. This new drive provides much higher horsepower capacity . . . delivers more dependable power per inch of drive width than ever before possible! Poly-V features a single unit V-ribbed belt across full width of the drive sheave—not an assembly of V-belts. Single unit belt design eliminates length matching problems — minimizes equipment down-time and belt replacement costs, runs cooler, smoother.

Just two cross sections of Poly-V Belt meet every heavy duty power transmission requirement. Ask your R/M Distributor for details about R/M Poly-V* Drive.

*Patented

WHEN YOU CHANGE DRIVES . . .
CONVERT TO POLY-V AND BE SURE!

RM1030

RAYBESTOS-MANHATTAN, INC.
MANHATTAN RUBBER DIVISION, PASSAIC, NEW JERSEY

ENGINEERED RUBBER PRODUCTS . . . "MORE USE PER DOLLAR"

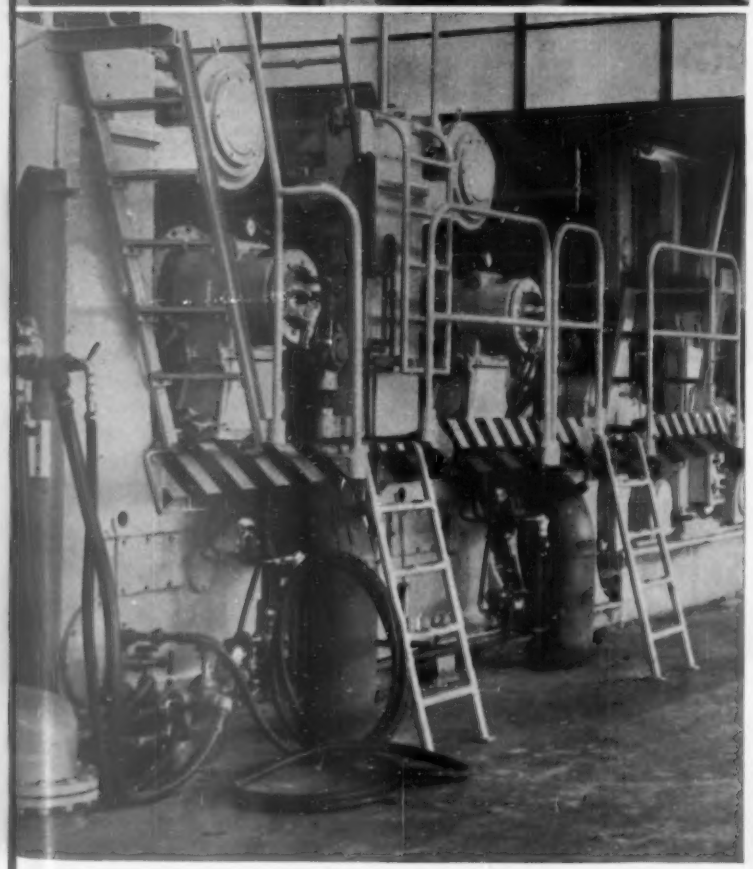
FACTORY

RAY-MAN CONVEYOR BELT

Engineered for 45° Idlers

- TRAINS NATURALLY
- TROUGHS DEEPLY
- HOLDS FASTENERS
- RESISTS IMPACT AND RIPPING
- REQUIRES NO BREAKER PLY
- DOUBLE COMPENSATION RELIEVES OUTER PLY STRESS
- EXCLUSIVE "XDC" LONG-WEAR COVER

Every component of a Ray-Man Conveyor Belt is *precision proportioned* to give you a balanced belt construction, with as much as ⅓ longer life expectancy. It's the same as getting ⅓ more conveyor belt for your money. Further savings are possible, if you use 45° Idlers. Properly engineered, you can haul a fuller load, or install a narrower conveyor. Ray-Man is guaranteed against ply or cover separation at the hinge line where the 45° angle proves too sharp for regular belt constructions. Write for Bulletin M303.

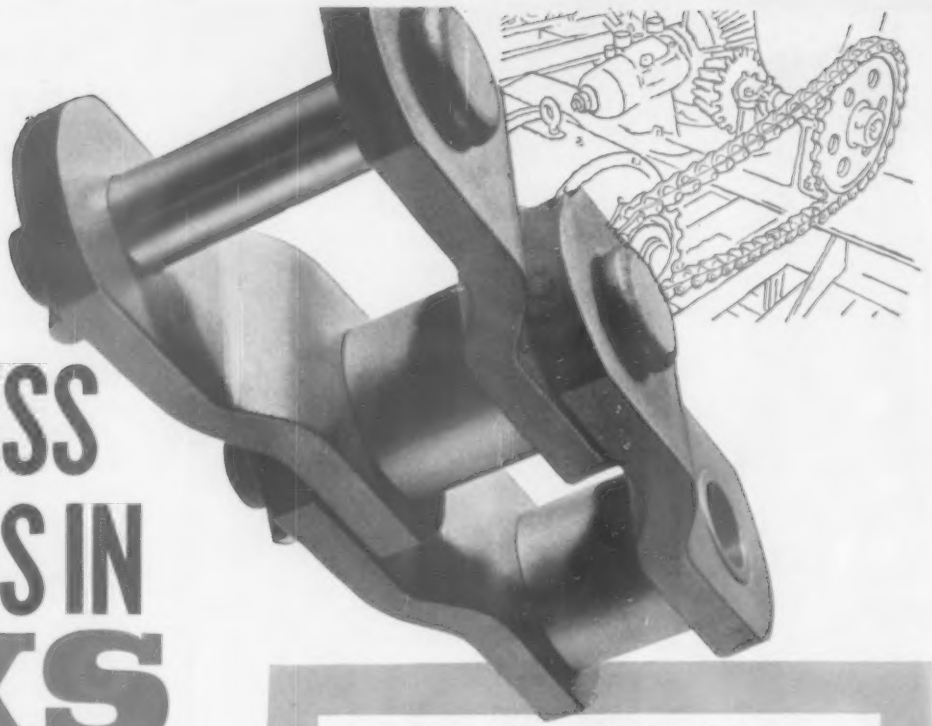


HOMOFLEX HOSE

more flexible, weighs less than any hose for equal pressure

- SUPER-STRONG
- PRECISION BUILT
- NO PRE-SET TWIST—WILL NOT KINK
- INSEPARABLE TUBE-TO-COVER BOND
- UNIFORM INSIDE AND OUTSIDE DIAMETERS
- EASIER, SAFER COUPLING

Strong, lightweight, and "flexible as a rope"—Homoflex is the easiest handling hose and lasts longer. Made in types for air, water, other fluids and gases. Ask about other types of R/M rubber hose for your job applications. Write for Bulletins M620 and M694.



FAR LESS STRESS IN LXS

THE CHAIN WITH NO "STRESS RAISERS"!
Link-Belt LXS brings long-term economy and efficiency to the most punishing drive and conveying jobs. With its "FULL-ROUND" design, LXS has no stress concentration points . . . none of the sharp corners which frequently shorten the life of many ordinary chains.

LXS is available with straight or offset sidebars. For details, contact your nearest Link-Belt office or authorized stock-carrying distributor. (See CHAINS in the yellow pages of your phone book.) Ask for our new, comprehensive Catalog 1050 and LXS Book 2454.

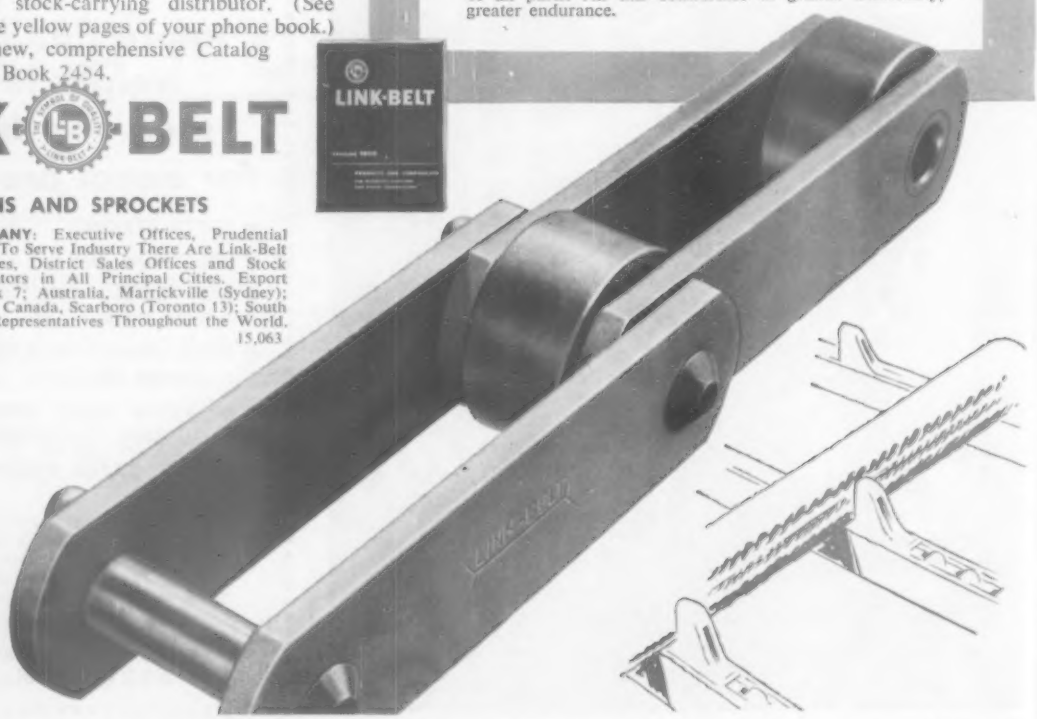
They're all of "FULL-ROUND" design

PINS BUSHINGS SIDEBARS

"FULL-ROUND" design eliminates traditional stress concentration points in Link-Belt LXS . . . provides maximum live bearing area between pins and bushings. Result: stress is distributed evenly.

Other LXS long-life features include controlled press fits plus use of selected steels and controlled hardening of all parts. All this contributes to greater uniformity, greater endurance.

LINK-BELT



CHAINS AND SPROCKETS

LINK-BELT COMPANY: Executive Offices, Prudential Plaza, Chicago 1. To Serve Industry There Are Link-Belt Plants, Warehouses, District Sales Offices and Stock Carrying Distributors in All Principal Cities. Export Office, New York 7; Australia, Marrickville (Sydney); Brazil, Sao Paulo; Canada, Scarboro (Toronto 13); South Africa, Springs. Representatives Throughout the World. 15,063

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WHEN THE PROBLEM CALLS FOR PAINT THE BEST ANSWER

IS INVARIABLY **Barreled Sunlight** ENGINEERED Paints

Safety coding, through the proper marking of plant hazards and protective equipment, plays an important role in industrial accident prevention programs. You have it, or *should* have it, in your plant!

To help you make sure you *are* making the most of paint to safeguard the lives of your plant personnel, why not call in your Barreled Sunlight representative for free "Color Survey" Service. This personal, in-plant survey by a trained color expert includes formal recommendations for a complete, practical painting plan tailored to your exact plant requirements.

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☐ Also, please send me your "Quick Reference Guide" to Barreled Sunlight Paints, plus your booklet, "How To Reduce Painting Costs".

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Title.....

Company.....

City.....*Zone*.....*State*.....

For more facts Circle 414 on Reader Service Card

"Here at SCOTT we're paper men...

"We're specialists at SCOTT PAPER COMPANY.

"We produce a variety of papers and paper products that can display tenacious strength yet be as soft as felt; or can shed water or absorb it thirstily; or can exhibit the properties of materials other than paper.

"We needed only to look at ourselves, as specialists, to be assured that the OTIS specialist approach to elevator maintenance was best for us.

"Here at SCOTT, vertical transportation is a vital part of our production line. Our two OTIS Freight Elevators are used to distribute large rolls of paper and paper stock to production areas. Our two OTIS Escalators carry production personnel between production levels.

"Are we satisfied? We've been using OTIS ELEVATOR MAINTENANCE since the freight elevators and escalators were installed in 1955. Shutdowns have been held to an absolute minimum—by real OTIS professional maintenance."

What is the OTIS *specialist's approach* to elevator maintenance?
It is MEN . . . MATERIALS . . . METHODS.

MEN: Elevator maintenance is no one-man job. It is an organization task requiring experts in many lines. No individual, even if he devoted his entire time to the job, could do it properly. It calls for men with an unusual combination of skills plus long OTIS training in studying parts, assemblies, functions, replacement procedures, testing and adjusting. Some degree of elevator complexity can be gleaned from the illustration at right.

MATERIALS: Original OTIS parts and specially designed OTIS maintenance equipment are within one hour of 90% of all OTIS elevators in the U. S. for use in scheduled replacements—and to hold emergency shutdowns to a minimum.

METHODS: With more than 40,000 elevators under OTIS maintenance, OTIS has developed an actuarial procedure that replaces wearing parts well in advance of their breakdown point to hold shutdowns to an absolute minimum and assure the highest possible safety.

escalator and elevator maintenance

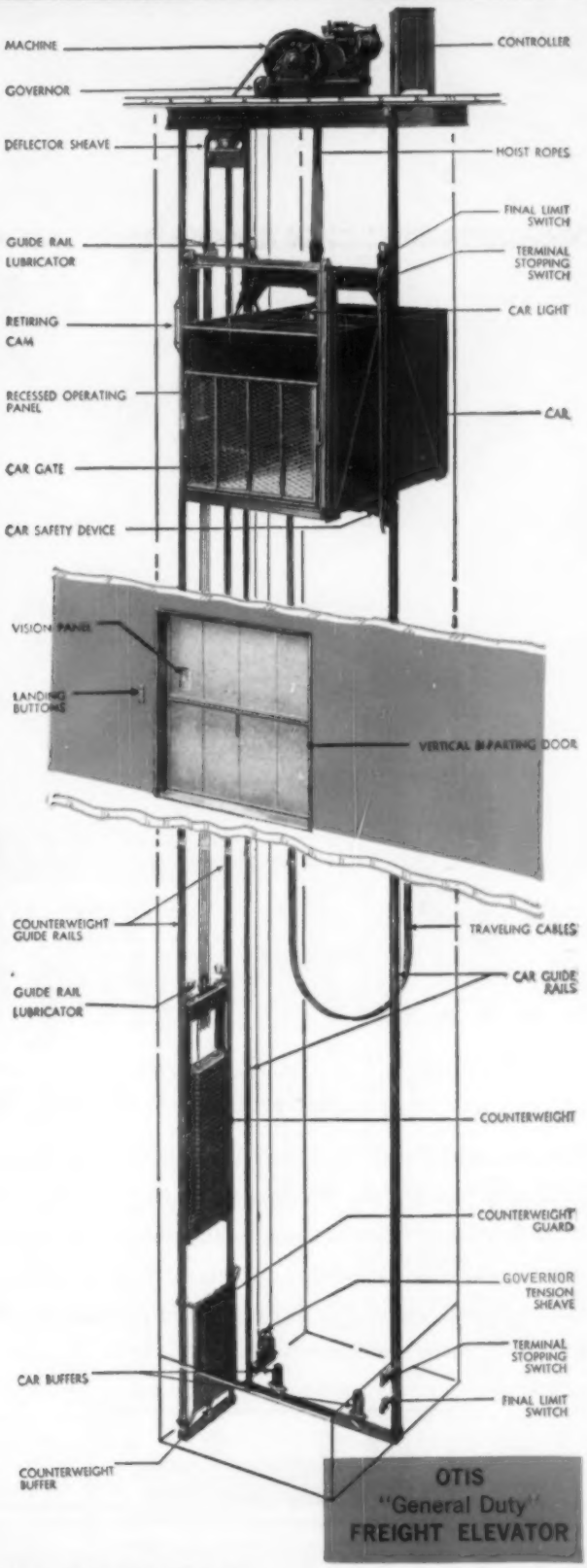
ASSURES CONTINUOUS PRODUCTION

OTIS ELEVATOR COMPANY • 260 ELEVENTH AVENUE • NEW YORK 1, N.Y.
OFFICES IN 297 CITIES ACROSS THE UNITED STATES AND CANADA

FACTORY

...not elevator maintenance men"

SCOTT PAPER COMPANY
WEST COAST DIVISION
EVERETT, WASHINGTON



OTIS
"General Duty"
FREIGHT ELEVATOR

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SELECT THE VALVES TO MEET THE NEED!

Select from full lines to operate and control a single OEM product . . . or a plant's entire production line!

Modern manufacturing demands quality . . . and Schrader Valves have it. Complete lines give you almost limitless range in planning air circuitry. The many extras in all Schrader Valves . . . superb engineering, compactness, strength, easy installation . . . make for precision operation. Your Schrader distributor is fully stocked, not only with Valves, but Cylinders and Accessories. He can help you with factory-trained experts and proven ideas.

The complete range of sizes and types of air circuitry products is stocked and cataloged by your Schrader distributor. Consult the yellow pages or write Schrader.

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457 Vanderbilt Avenue, Brooklyn 38, N. Y.

QUALITY AIR CONTROL PRODUCTS

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try this on your pipe...

(it's Pittsburgh Fiber Glass Pipe Insulation)

Acme Insulation Company, Pittsburgh, did . . . on the piping job at Pittsburgh's new Gateway Parking Garage in Gateway Center. And here's what Acme owner Walter S. Peebles says about this installation:

"We chose Pittsburgh Fiber Glass Insulation for its efficiency, appearance and permanence. It's lightweight, handles easily, cuts readily with a knife, is quickly applied. There's a minimum of waste material.

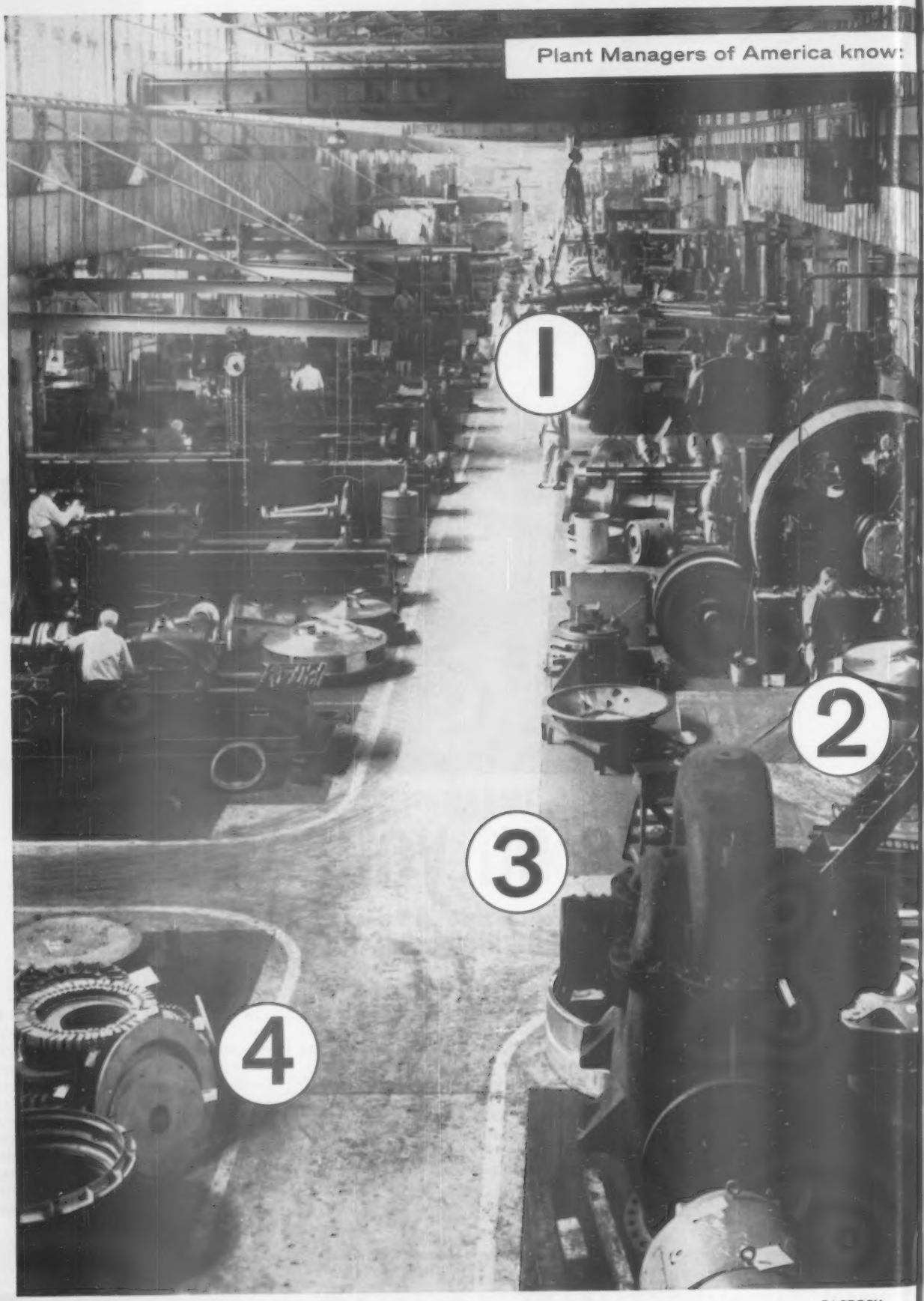
"We've found that Pittsburgh Pipe Insulation holds its size and shape, does not effect the metal it covers, and has a fine record for low-cost maintenance. We used 8,300 ft of it on ½" to 14" pipe for underground heating, snow melting, chilled water lines, general plumbing, sill cocks and drain lines.

"It's probably the finest insulation that can be used, especially in subsurface locations."

FOR TOP THERMAL CONTROL, THIS IS IT! Pittsburgh Fiber Glass Pipe Insulation is a molded flexible hollow cylinder, slit along its length to provide quick application to pipes or tubing. It has high thermal efficiency for any type pipe insulating job and is surprisingly economical. You can get complete details from your nearest PPG Fiber Glass Sales Office, or by writing to *Pittsburgh Plate Glass Company, Fiber Glass Division, One Gateway Center, Pittsburgh 22, Penna.*

SALES OFFICES: Atlanta, Attleboro, Buffalo, Charlotte, Chicago, Cincinnati, Cleveland, Dallas, Denver, Detroit, Fort Wayne, Houston, Kansas City, Los Angeles, Louisville, Milwaukee, Minneapolis, New Orleans, New York, Philadelphia, Pittsburgh, St. Louis, San Francisco and Washington.

FIBER PPG GLASS PITTSBURGH PLATE GLASS COMPANY


Plant Managers of America know:
1
2
3
4

American Mutual aims at Better Protection . . . Lower Cost

Think how shop production would be interrupted if . . .

1. The bridge crane drops its load.
2. These steps were used for climbing and worker slipped.
3. Aisles were not so clear, slowing traffic.
4. Edge standing discs topple over.

Even the most conscientious of your workmen can become so accustomed to daily job routine that the threat of danger may pass unnoticed. What follows is only too familiar to most of us—an unfortunate accident that interrupts production, possibly injuring workers.

Protecting men, materials and equipment from accident is one of industry's most troublesome problems. In conducting your program to control these accidents, the advice and counseling of AM Safety Engineers on loss control can prove very useful to you.

Over the years, many AM policyholders who have consulted with the AM Safety Engineers have benefited from a lower accident rate and lower insurance costs. Policyholders also valued the improved production and profits which tended to flow from a better accident rate. Why don't you talk to an AM man first hand? Or ask us to send you the names of policyholders near you who have had direct experience working with American Mutual. They have discovered what *better* protection . . . *lower* cost . . . can mean to them.

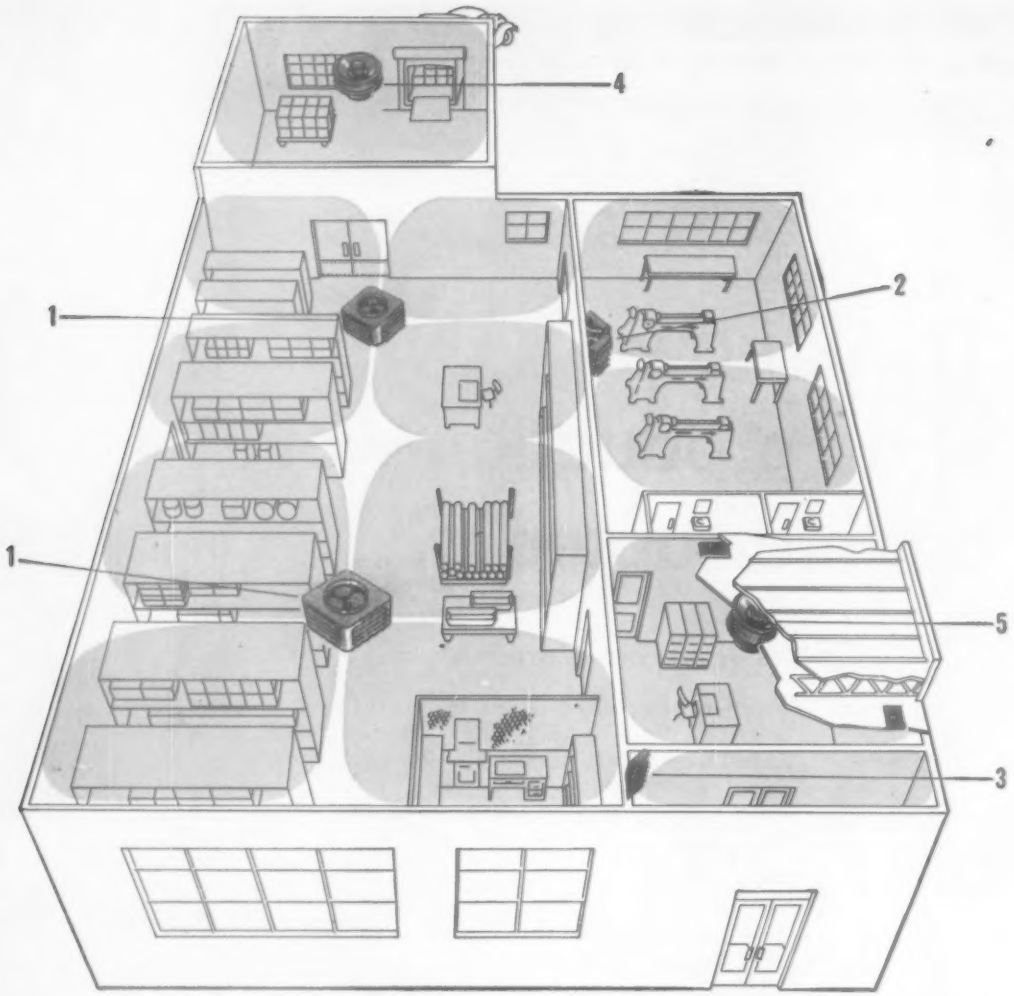
Why not write American Mutual, Dept. F-6, Wakefield, Mass.

Our business is protecting your business . . . better

"The First American Liability Insurance Company" . . . a leading writer of Workmen's Compensation, all forms of Liability, Crime, Automobile, Group Accident and Health Insurance.

American Mutual

LIABILITY INSURANCE COMPANY



CARRIER SHAPES ITS HEAT TO FIT THE SPACE

—saves you money from the start!

Carrier Unit Heaters distribute their heat in a designed pattern. These patterns can be made to fit any space. **Result:** reduction in installation costs, because fewer units are needed. And savings in operating costs. One Carrier "Clover Leaf" Heater does the work of two or more vertical discharge heaters or four to six horizontal heaters.

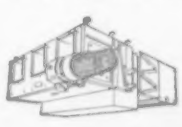
The building layout shows usage of all types of Carrier Unit Heaters. Two Four-Way Unit Heaters use the full "Clover Leaf" discharge pattern, reach to the farthest corners of the large warehouse area (see 1). The smaller machine shop area is kept warm by two Horizontal Unit Heaters (see 2); and another keeps the entrance comfortable (see 3). The shipping area is high ceilinged, and a Vertical Unit Heater streams warm air down to the working level (see 4). A similar unit, recessed in the ceiling, heats the office through diffusers (see 5).

For details about Carrier Unit Heaters, call your Carrier Representative or Wholesaler listed under "Heaters—Unit" in the Yellow Pages. Or write Carrier Air Conditioning Company, Syracuse 1, New York.

Carrier offers every type of equipment for any commercial or industrial job

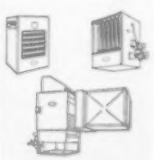
Carrier

Heat Diffusers – Direct Fired for gas or oil



Heating and Ventilating Units for steam and hot water

Unit Heaters for steam and hot water



Gas Unit Heaters and Duct Furnaces

For more facts Circle 419 on Reader Service Card

FACTORY

MAIL the coupon for latest Safety Switch Bulletin

Square D Company, Dept. SA-106
1601 Mercer Road, Lexington, Kentucky

Please send me your latest SAFETY SWITCH BULLETIN

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COMPANY_____

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CITY_____ ZONE____ STATE_____

THE ONLY COMPLETELY SAFE SAFETY SWITCH HAS VISIBLE BLADES!

Square D gives you Safety you can See!

• The men who pull the switches will tell you what can happen when a switch, *believed* to be open —*isn't*. A lot of things can happen—and every one of them is bad. Personnel safety is in jeopardy. Motors can single-phase. Machinery and work can be damaged. Down-time can skyrocket.

Doesn't it make sense to insist on **Visible Blade** construction which gives you a road block against any of those possibilities? Doesn't it make equally good sense to insist on the safety switch which gives you that construction—plus a lot of other performance advantages? Evidently it does, because *Square D switches have never been out of first place in more than 50 years!*

They cost no more...why settle for less?

SQUARE D COMPANY

wherever electricity is distributed and controlled

RAPISTAN Ideas HANDLING

SO YOUR PRODUCTS ARE "DIFFERENT"!

Of course your products are different — that's what makes your warehousing problem so much like everyone else's. If you've rejected some of the new concepts of warehousing because your products or warehousing problems are "different", you may be denying yourself important savings of space and cost.

Through many years of pioneering experience in modern warehousing techniques, Rapistan engineers have found that even the most "impossible" warehousing situations can be modernized, at reasonable cost.

Very often, the key to gaining the advantages of "live storage" for problem parts is to place them in a "conveyable" condition. The shapes, sizes, and handling requirements of products may seem to preclude the use of live storage techniques. But simple, low-cost, standardized containers may allow you to store such materials on wheels or rollers, where they belong for reduced handling and easy accessibility.

Standardizing containers for more efficient warehousing can be much less complicated than it may seem at first glance. Pallets, tote boxes, trays or hangers may serve as suitable containers or carriers, at very low cost.

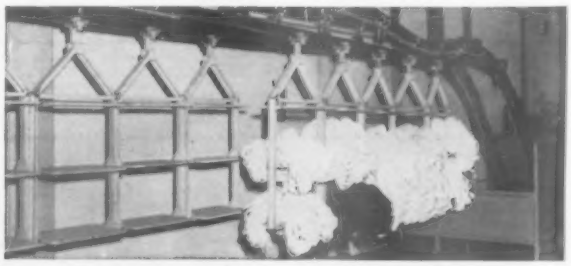
Your Rapistan engineer has a wealth of experience in putting non-conveyable items into conveyable condition, and applying the principles of live storage to those "impossible" warehousing problems. He'll be glad to suggest a few ideas that may work in your case. We'll send you some examples of knotty problems untangled by low-cost containerization.

CONTAINERS CAN BE STANDARDIZED to just a few shapes and sizes to handle most parts. This plant warehouses almost 1,000 different parts, using only three sizes of tote pans and boxes, and two pallet designs. Instead of handling individual parts, they are handled by the hundreds. Transfers are easier and safer, man-hours of handling labor are reduced.

HEAVY GENERATOR PARTS, in this electrical plant, are "warehoused" at several points in the progressive assembly operations. Low-cost wooden pallets serve as standard containers allowing assembly and storage operations to take place on conveyor for maximum efficiency.

MODERN WAREHOUSING TECHNIQUES including many examples of live storage are illustrated in this up-to-date manual.

R-K OVERHEAD CONVEYOR LETS YOU CLAIM "AIR RIGHTS" FOR LIVE STORAGE



An inexpensive, simple fixture can make many odd-shaped, "problem pieces" suitable for live storage on Rapistan-Keystone overhead trolley conveyor . . . releasing valuable floor space. On R-K conveyor, they are in their most accessible form, since the overhead conveyor delivers them to an order selection point or the next work station where the conveyor dips to within easy reach of workers.

We'll send you illustrated examples of unusual products being warehoused efficiently and economically on R-K overhead conveyor.

Rapistan®

CONVEYING EQUIPMENT

The RAPIDS-STANDARD CO., Inc.

696 Rapistan Building, Grand Rapids 2, Michigan

FACTORY PRESS TIME REPORT • DECEMBER 1960

Looking ahead in business

You can breathe more easily about next year's business outlook, thanks to facts uncovered by McGraw-Hill's fall survey of business plans for new plant and equipment expenditures.

Spending for new plants and equipment in 1961, the survey revealed, will fall only 3% short of 1960's substantial level. Capital outlays, expected to total $35.1-billion in 1961, will once again provide a solid foundation for all business activity.

•

Manufacturing companies will set the general spending tone. Their present plans call for capital expenditures totalling $14-billion in 1961, a 3% decline from 1960's estimated total. Some industries will increase outlays, others will cut back.

Expecting higher outlays are: auto producers; electrical machinery makers; the chemical, petroleum, and coal products industries; and the food and beverage producers.

Auto men forecast an increase of 7% annually to a high mark of $950-million. Electrical machinery makers will add 10% to their capital budgets, lifting outlays to $680-million. Chemical process and petroleum will be up 3%, food and beverages up 6%.

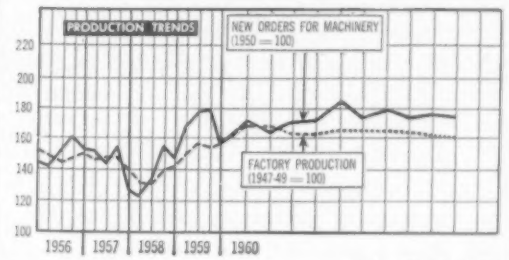
Planning substantially lower capital expenditures are: iron and steel producers, heavy machinery makers, textile and transportation equipment manufacturers, and "other major metalworking" industries.

Steel companies plan to cut spending by 10%, bringing the total down to $1.4-billion. Machinery makers expect a 3% dip, lowering their outlays to $1.1-billion. The transportation equipment people plan to reduce spending by 9%, while other metalworking industries expect to drop by 12%. Largest reductions will come in the textile field where companies indicate a 21% drop.

•

On the sales front, manufacturers and paper and pulp producers expect better than average performance. They look for a 5% gain in sales in 1961. Nonferrous metals producers and food and beverage firms look for a 4% increase in sales.

FACTORY FIGURES OF THE MONTH



Indicator	OCT.[p] 1960	SEPT.[r] 1960	OCT. 1959
New Orders for Machinery (exc. elec.)[1]	173.0	175.0	172.0
Contracts for Industrial Construction[2]	192.0	179.0	171.0
Factory Production[3]	160.0	161.0	154.0
Consumers' Prices (cost of living)[4]	127.2	126.8	125.5
Industrial Prices (materials, supplies)[4]	128.1	127.9	128.4
Manufacturing Employment (millions)[4]	16.3	16.5	16.2
Total Employment (millions)[5]	71.1	71.2	70.1
Unemployment (millions)[5]	3.6	3.4	3.3

[p] = preliminary [r] = revised

Sources: 1. McGraw-Hill Dept. of Economics (1950 = 100); 2. Engineering News-Record (1950 = 100); 3. U. S. Federal Reserve Board (1947-49 = 100); 4. U. S. Dept. of Labor, Bureau of Labor Statistics (1947-49 = 100); 5. U. S. Dept. of Labor, Bureau of Labor Statistics.

Companies in petroleum, electrical machinery, rubber, and miscellaneous manufacturing expect a 3% growth in their business volume in 1961. Iron and steel producers see a 2% sales increase for their industry.

Auto companies expect no increase in sales, nor do manufacturers of stone, clay, and glass products.

The transportation equipment industry is alone in manufacturing. It expects reduced business in 1961.

Significantly, next year's capital spending plans were drawn while manufacturers were operating at only 79% of their productive capacity. A sharp increase in output could thus stimulate greater plant and equipment outlays.

Most important, with capital investment holding at a relatively high level and increased spending anticipated in other sectors of the economy, generally good business seems to be assured for 1961.

Leads to read and save

THIS FILING SYSTEM is designed to give quick access to past FACTORY articles that can help you solve your current operating problems. Here's how it works:

1. All major articles (set here in bold type) and many short items are classified according to a functional code.

2. Certain articles are also coded (see numbers in parentheses) to show secondary or closely related topics.

3. To use, cut up the items below. Paste them on 3x5-in. cards, file by code number. To cross-index, copy information on a second card, file by secondary code.

For ways to use your Problem-Solving Guide and an explanation of this Decimal Filing System, write Reader Service, FACTORY, 330 W. 42nd St., New York 36.

1.0–1.4 Plant maintenance and engineering

MANAGEMENT AND PRACTICES (1.1)

1.104 Maintenance system runs itself (Dec. '60) p. 176
1.110 Pacifist rat trap cleans, doesn't kill (Dec. '60) p. 148
1.111 Giving the boot to indoor rain (Dec. '60) p. 142
1.117 Switch shrugs off heat and humidity (Dec. '60) p. 144

BUILDINGS AND YARDS (1.2)

1.203 Floating floors (Dec. '60) p. 145 (1.407)
1.204 Rolling charwomen scrub plant (Dec. '60) p. 148
1.206 Maintenance painting (Dec. '60) p. 73 (1.11)
1.207 Good as new—and 30 years old (Dec. '60) p. 60
1.207 Ready for plant improvements? (Dec. '60) p. 92

SERVICES AND FACILITIES (1.3)

1.305 Mobile thermocouples tell hot story (Dec. '60) p. 142

ELECTRIC SERVICES (1.4)

1.401 Electronic chairman gets politeness (Dec. '60) p. 141
1.401 Cinemascope TV measures steel (Dec. '60) p. 141
1.401 Robot timekeeper works by phone (Dec. '60) p. 149
1.402 Silicon controlled rectifiers (Dec. '60) p. 82 (1.405)
1.405 Circuit breakers keep the power on (Dec. '60) p. 146
1.406 Stands on one foot (Dec. '60) p. 142 (2.320)
1.409 Robot traffic cop aids welding (Dec. '60) p. 140
1.412 Rectifier or motor generator? (Dec. '60) p. 145

2.0–2.4 Production

ORGANIZATION AND MANAGEMENT (2.1)

2.105 Peeping Tom bags fit all sizes (Dec. '60) p. 146

PRODUCTION CONTROLS AND SYSTEMS (2.2)

2.201 More manufacturing information (Dec. '60) p. 86
2.203 Restless x-ray allows fast set-up (Dec. '60) p. 150
2.205 3-D charts stand out (Dec. '60) p. 149 (2.103)
2.205 Plastic gives dirt the heave-ho (Dec. '60) p. 150
2.206 Today's crisis in quality control (Dec. '60) p. 66

METHODS AND TECHNOLOGY (2.3)

2.302 Screwdriver for square set screws (Dec. '60) p. 142
2.310 Electroshaper dissolves metal (Dec. '60) p. 141
2.311 Ideas give production efficiency (Dec. '60) p. 143
2.316 Electrostatic touch-up cuts costs (Dec. '60) p. 146

MATERIAL HANDLING AND LAYOUT (2.4)

2.402 3-lane conveyors are KP's delight (Dec. '60) p. 146
2.403 Crane scale solves handling problem (Dec. '60) p. 150
2.404 Home-made cart eases handling (Dec. '60) p. 141
2.404 Weighing by gravity (Dec. '60) p. 145 (2.204)
2.405 In-plant packaging for profits (Dec. '60) p. 88
2.409 Storage on wheels (Dec. '60) p. 142 (2.315)
2.410 Trackless trains on a timetable (Dec. '60) p. 98

3.0–3.4 Plant management

ORGANIZATION AND POLICIES (3.1)

3.105 Better records management (Dec. '60) p. 93 (2.102)

PERSONNEL DEVELOPMENT (3.2)

3.201 A monument to waste (Dec. '60) p. 158 (2.201)
3.202 Why not a manpower audit? (Dec. '60) p. 154 (3.204)
3.204 Big wheels go to get info (Dec. '60) p. 157 (3.104)
3.205 Horse sense in employment testing (Dec. '60) p. 70
3.207 Your job in a nutshell (Dec. '60) p. 154 (3.105)

EMPLOYEE RELATIONS (3.3)

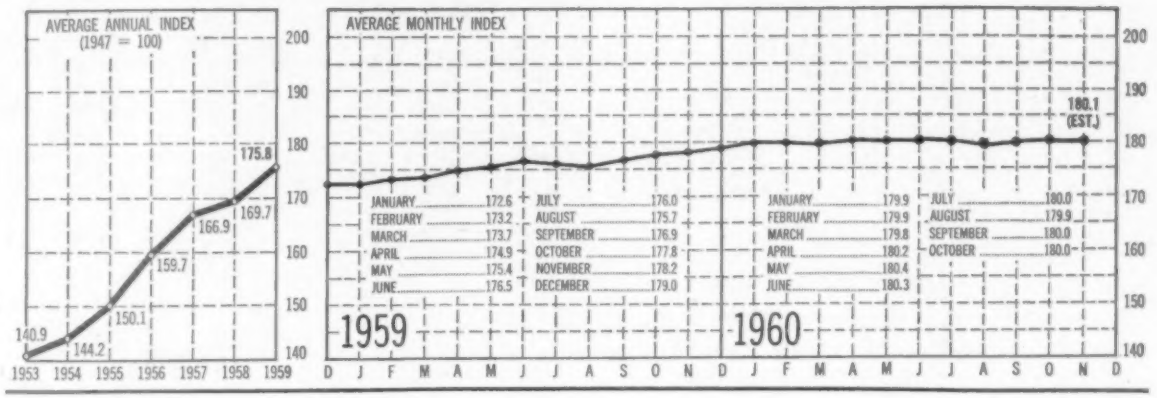
3.303 Classy people: Handle with care (Dec. '60) p. 157
3.306 Automatic plant lunchrooms (Dec. '60) p. 80 (2.303)
3.307 Gifts buy crayons or computers (Dec. '60) p. 157
3.310 Pint lost—paradise gained (Dec. '60) p. 154 (3.402)
3.312 A safe place to park (Dec. '60) p. 148 (3.306)
3.312 It really pays to work safely (Dec. '60) p. 148 (3.402)
3.312 Wives up front in safety drive (Dec. '60) p. 158
3.320 Hi-frequency welds form copper tubes (Dec. '60) p. 144

LABOR COSTS (3.4)

3.403 The hidden skeletons (Dec. '60) p. 144 (3.314)

FACTORY PRESS TIME REPORT • DECEMBER 1960

Cost index of plant maintenance



Index remains steady

Balancing trend should continue until mid-year when business is expected to rise.

The average cost of factory maintenance, as measured by FACTORY's Cost Index of Plant Maintenance, remained unchanged in September and October at 180 (1947 = 100).

Though labor costs were boosted higher by a rise in carpenters' wages, the increase was offset by a one-point dip in materials for buildings and facilities.

Several other materials prices gyrated sharply in October. The price of copper pipe and tubing retreated 27.1 points, while the index of glass prices rose 5.7 points. Other drops were recorded in the index of electrical control prices (down 2.3 points) and cutting tools (off 1.2 points). But when all the plus-and-minus price changes for the month were added together they cancelled each other out.

Throughout most of 1960, FACTORY's Cost Index has drifted rather indecisively. Up for a month or two, then down again. This happened largely because materials prices softened as general business trends turned sluggish. For the next few months, this general pattern of sluggish industrial prices should continue.

When final figures are in, FACTORY's Cost Index undoubtedly will show less upward fluctuation during 1960 than it has for any of the past six years. Next year business is expected to gather steam in mid-year. Then industrial prices should begin to edge higher.

Furthermore, a boost in plant maintenance costs is likely at the beginning of the next year. Reason: Higher wages, generated by some automatic wage hikes that go into effect at that time.

	AVERAGE 1959	OCT. (Preliminary)	SEPT. (Revised)
Building and Facilities Index	166.5	170.3	170.6
Materials	142.3	138.2	139.2
Brick	152.5	155.5	155.1
Elec. fixtures	129.0	130.9	131.3
Elec. switches, boards, fuses	185.6	179.8	182.1
Elec. wire, copper	138.9	148.7	148.7
Glass	152.0	147.7	142.0
Gutters, spouts, ducts	178.0	180.4	180.4
Gypsum products	140.8	140.9	140.9
Heating equipment	127.7	125.2	125.2
Lumber	134.5	123.4	125.3
Millwork	155.7	155.3	156.0
Paint	130.1	130.2	130.2
Pipe, cast iron	170.4	170.4	170.4
Pipe, steel	190.9	188.7	188.7
Pipe & tubing, copper	154.1	125.3	152.4
Roofing	123.7	113.2	113.2
Sanitary fixtures	155.6	161.8	161.8
Sash, metal frame trim	140.9	136.5	136.5
Solder	124.1	123.9	123.9
Steel, structural	236.3	236.3	236.3
Tanks, steel	138.0	189.2	139.2
Valves & fittings	166.7	164.6	164.6
Wire mesh	162.6	165.5	165.5
Labor	182.6	191.7	191.5
Carpenters	168.9	179.5	179.0
Electricians	191.1	199.6	199.6
Painters	187.9	196.0	196.0
Equipment Index	179.5	184.1	184.1
Materials	176.1	177.3	177.4
Abrasives	161.0	157.9	157.9
Alloys, non-ferrous	125.4	123.3	123.3
Bars & plate, steel	227.1	227.2	227.2
Bearings	164.1	155.4	155.4
Belting	157.3	164.2	163.7
Bolts, nuts & screws	225.6	223.8	223.8
Chain	184.0	195.5	192.1
Controls (electrical)	185.6	179.8	182.1
Gear-reduction units	181.7	181.7	181.7
Hand tools, mechanics	198.2	204.8	204.6
Lubricants	124.1	125.7	125.7
Motors	147.3	142.6	142.5
Non-ferrous metals	129.0	136.6	136.6
Precision tools	156.6	158.2	158.2
Pumps	194.8	196.6	196.6
Tools, cutting	172.4	188.8	190.0
Valves & fittings	166.7	164.6	165.5
Labor	181.8	188.6	188.6
All mfg. labor	179.9	184.4	184.4
Machine tool labor	184.2	192.7	192.7
FACTORY'S COST INDEX	**175.8**	**180.0**	**180.0**

Looking ahead in labor

Union leaders are drafting a broad set of goals under the new Kennedy administration—much broader than they were prepared to seek if the Republicans had kept the White House. They backed the winning Democratic Kennedy-Johnson ticket with more money and manpower than they've ever put into a political race. They expect returns from a "friendly" White House and a Democratic Congress.

The goals come in two parts. The first calls for a quick legislative thrust in the new 87th Congress. The plan is to reverse three defeats labor took from the last Congress: One through the Landrum-Griffin reform law, which union officials score as their worst legislative setback since the 1947 Taft-Hartley Act. A second through failure to win a new minimum wage bill. And a third through a law to ease curbs on construction picketing.

As chairman of the senate labor subcommittee, Kennedy led the union fight for all three—and failed. When he's president, the unions anticipate they'll do much better—not only in getting a $1.25 minimum wage and an eased picketing measure, but possibly also by making some changes in the reform bill.

Here's why. Though the new Congress is more conservative than the 86th (there are 22 more GOP members in the House), labor strategists believe an active White House will make the difference in their favor. They don't blame past legislative defeats on a Republican-Southern Democratic coalition alone. They lost out because of the threat of a veto from President Eisenhower in some cases. And Landrum-Griffin was passed, the union theory goes, because Eisenhower made a last-minute nationwide television appeal for the reform law.

Part two of the union goal is more far-reaching—with many more pitfalls. What the labor strategists want, now that they have a shift in atmosphere at the White House, is a change in atmosphere around labor and management. They want a bargaining truce—an end to bitter union-employer contests that marked the basic steel industry and General Electric negotiations this year. If these disputes grew from management power at the negotiating table, organized labor believes a Democratic administration may give labor a needed boost—and open the way to peace-making negotiations.

The first step toward the second goal will be a national conference on automation. Top leaders of management, labor, and the government will be called to Washington by the Kennedy administration to discuss ways of promoting automation, at the same time minimizing its effect on employment. This will be a general conference—not industry-by-industry, as Labor Secretary Mitchell has proposed.

Another tack will be taken against labor-management disputes. With union backing, Kennedy will include in his labor legislation package an amendment to the Taft-Hartley Act's section on national emergency disputes. Where the law now limits the White House to seeking an 80-day injunction and setting up an emergency board to investigate a national emergency strike, Kennedy wants a series of weapons. These include such alternatives as seizing an industry, or naming an investigation board at any time in the dispute—with power to recommend settlement terms. However, Kennedy rejects compulsory arbitration.

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Take the secretary of labor. Besides his normal duties, he now administers the Landrum-Griffin law. This places government at the right hand of union leaders. Under Secretary Mitchell—considered by labor to be its closest friend in the administration—the reform law has been used in an attempt to void seven union elections. And it has investigated thousands of complaints by union members. Labor officials prefer to have L-G administered by a Democratic labor secretary.

The National Labor Relations Board is equally vital and is a current target of unions, who claim it is pro-management. Of the five members appointed by Eisenhower, one—Arthur A. Kimball—is a recess appointment and can be immediately replaced. Member Joseph A. Jenkins's term expires next August. With two appointments by a Democratic White House, unions believe the voting may shift.

SEE LABOR RELATIONS NEWS, PAGE 162

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BRONZE—Ancient symbol of greatness and strength—is still one of the basic materials used by Powell in the manufacture of quality valves for modern industry. Also—Powell offers a complete line of iron, steel and corrosion-resistant valves—all types—in all popular sizes—to satisfactorily take care of every one of your flow control requirements.

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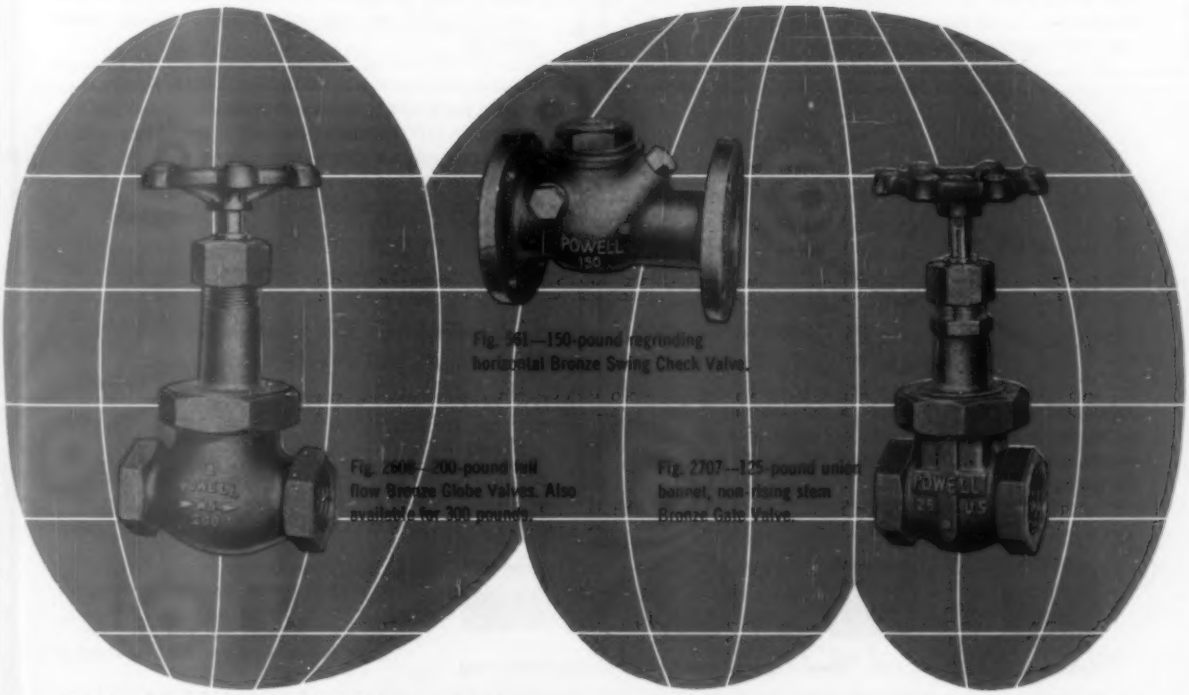

Fig. 361—150-pound regrinding horizontal Bronze Swing Check Valve.

Fig. 2608—200-pound Y-pattern flow Bronze Globe Valves. Also available for 300 pounds.

Fig. 2707—125-pound union bonnet, non-rising stem Bronze Gate Valve.

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FACTORY PRESS TIME REPORT • DECEMBER 1960

Looking ahead in labor

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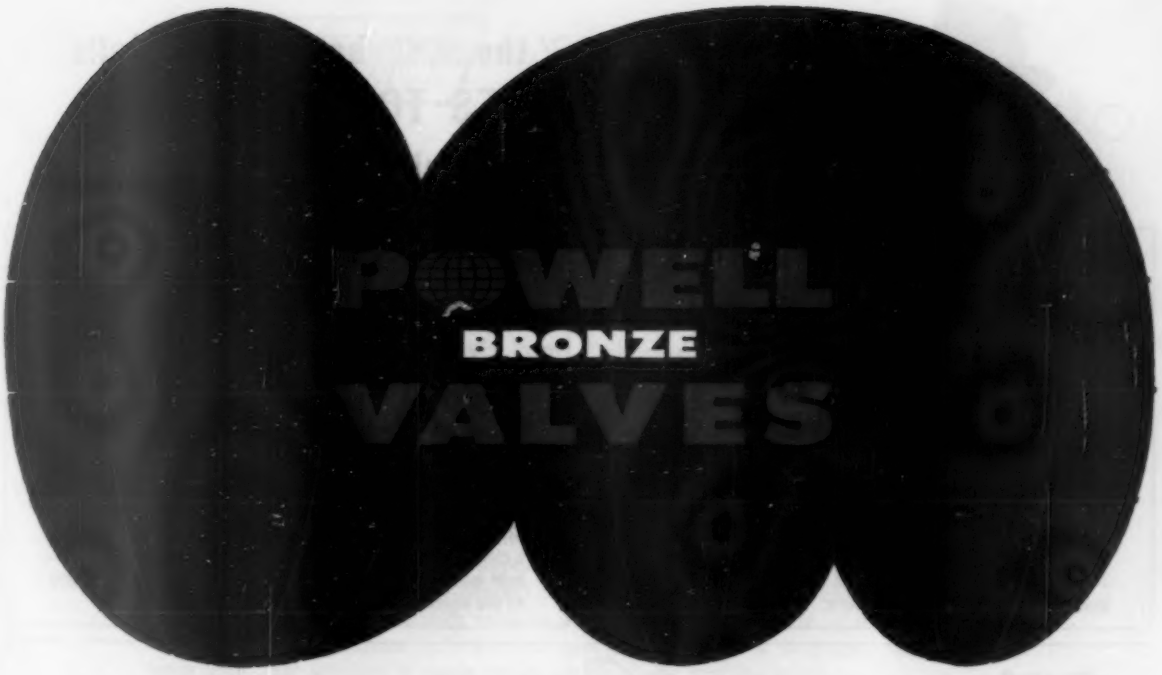
SEE LABOR RELATIONS NEWS, PAGE 162



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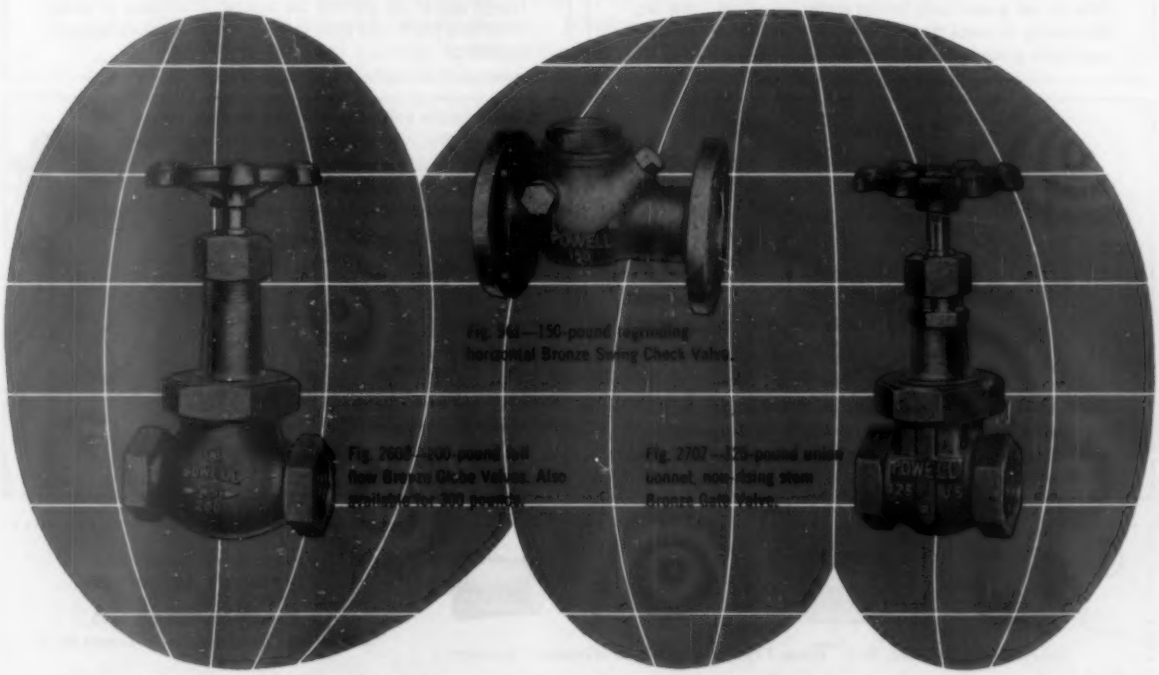

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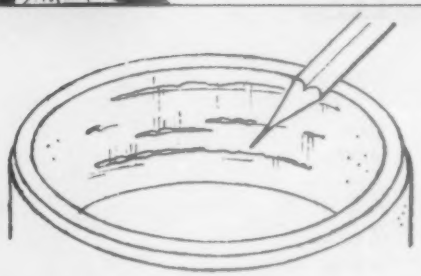
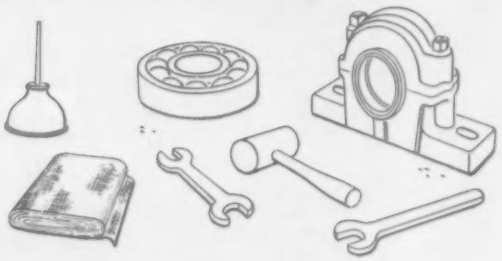
DISTRIBUTOR DAN the SKF bearing man, tells

WHAT DIRT DOES TO BEARINGS

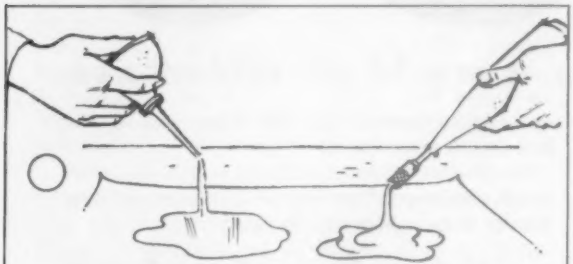
—and how you can help keep it out



LOOK FOR POLISHED, CLEARLY-MARKED BALL OR ROLLER PATHS. They're sure signs that dirt is getting into your bearings, causing lapping of the parts and ultimate failures. To eliminate this problem, follow the steps shown here.

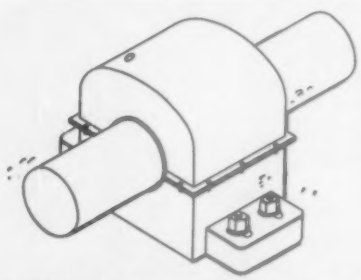


START WITH GOOD "HOUSEKEEPING." Work with clean tools in a clean area. Before you replace a bearing, clean the housing—both inside and out. Always handle a used bearing as carefully as you would handle a new one.



LOOK OVER YOUR LUBRICANTS AND LUBRICATING EQUIPMENT. Dirty oil and grease carry foreign matter with them, right into the bearing. So check them for cleanliness before you use them —and your grease guns and oil cans, too.

IS THE SEAL BENT OR WORN? If it is, dirt and dust and other foreign matter can get into the bearing. If moisture or water is present, you'll need seals made of special moisture-resistant materials.



WHERE DIRT IS A CONTINUAL PROBLEM, try shrouding the bearing housing in a metal box like the one shown here. It's inexpensive, easy to build and helps deflect dust and dirt away from the bearing.

Whenever you're baffled by a bearing problem, consult your Authorized SKF Distributor. His staff of experienced bearing specialists are always ready to serve you—and he stocks all types and sizes of the bearings you need, ready for immediate delivery.

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FACTORY

A year of accomplishment

As this year 1960 drops swiftly through the glass, plant management can reflect with profit upon its accomplishments—and its failures—in the past 12 months. Accomplishments—there have been many. Failures—a few. Both these measures of effectiveness can serve as your guideposts in the year that's coming up fast.

Plant management can be proud of its victories in the areas of cost reduction. Prices of industrial equipment have remained stable. Costs of consumer products have halted their rise. The Cost Index of Plant Maintenance has leveled off. The American public can gratefully trace most of these deflationary effects back to better, tougher management of plant operations in the manufacturing industries. Obviously, the motivation was supplied by a dizzying swing to a buyers' market. And corporate management responded here by clipping profits a bit closer than is comfortable. But the records seem to indicate that one segment of industrial management can be relied upon to produce a little more for a little less. And, invariably, that segment is made up of the men who run the plant.

In the area of labor costs, too, plant management has had a year in which it held firm. The long precedent of once-a-year wage increases has been broken. The cost-of-living escalator clause (which supplies the momentum for the wage-spiral lift) was knocked out of contracts in the electrical manufacturing industries. Even more encouraging was the atmosphere of labor relations in general. Factories have had fewer strikes in 1960 than in any year since 1945.

While the political fortunes of 1960 may have disappointed many business people, the year will be remembered as the one in which plant management people for the first time demonstrated leadership in the political arena. The philosophy of responsible political activity, so long urged by the United States Chamber of Commerce and the National Association of Manufacturers, has finally caught on. And this movement promises to be a continuing one.

On the other hand, plant management has shown two characteristic weaknesses in 1960. First: Despite the best of intentions, it has remained woefully weak in solving the problem of what to do with the labor it saved as it cut operating costs. Second: In the face of a profit-pinch, plant management continued its shortsighted curtailment of purchases of profit-making tools.

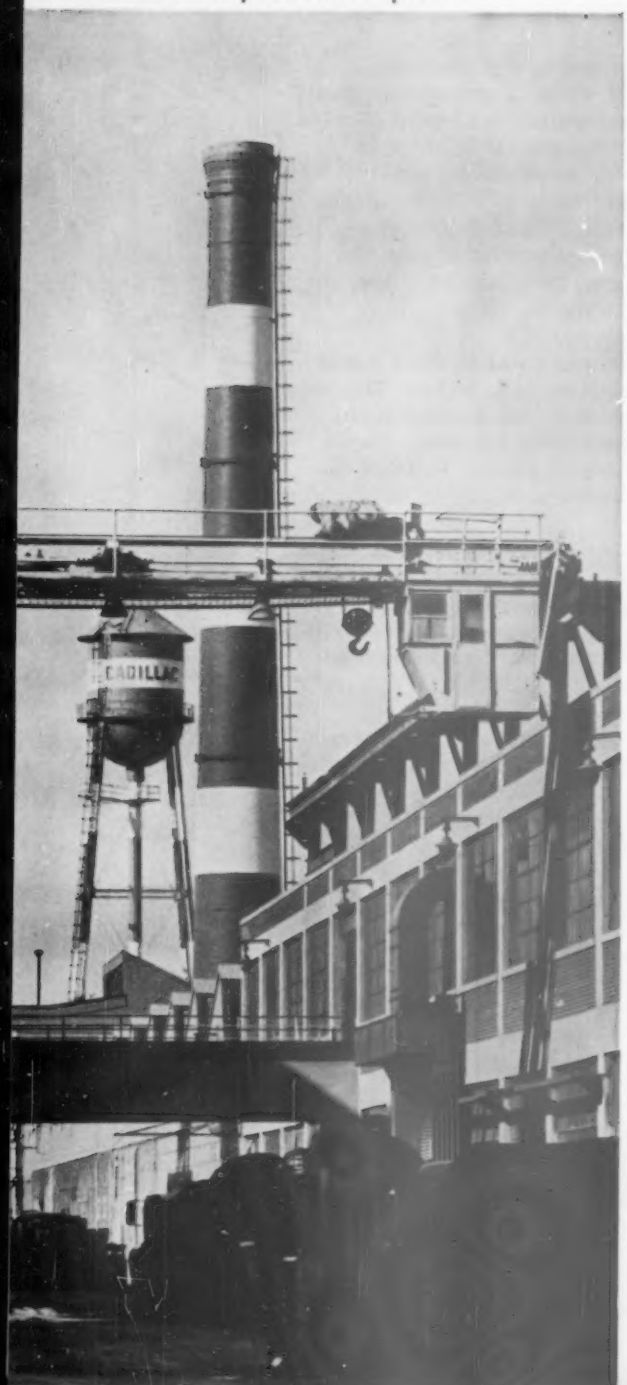
Plant management can, and should, score more successes in 1961 than it did this year. FACTORY expects that the men who run the plants will hold the line again in manufacturing and labor costs. We expect that they will also serve the public responsibly, both in politics and in handling displaced employees. And that they will spend their new equipment dollars more wisely to meet the accelerating challenge from foreign competition.

L. R. Bittel

EDITOR-IN-CHIEF

BEFORE—a deserted wreck

TODAY—a productive plant



COVER STORY

A fast-moving management team resurrected

With a few exceptions, it's . . .

GOOD AS NEW—

"Plant Four was a good decision. I get a lift every time I go over there." The proud words are from George Elges, assistant works manager of Cadillac Motor Car Division, General Motors Corporation, Detroit. Elges has a right to be proud—as do many other members of Cadillac's operating management team. Their calculated gamble on a near-derelict plant has paid off handsomely.

Plant Four is Cadillac's stamping (and some machining) plant, nine miles from the Division's main manufacturing site. In years long past, it was the proud facility of the Hudson Motor Car Company. But in 1956 it was an abandoned, junk-filled property in the hands of real estate speculators.

Cadillac, in early 1956, had completed a study of the cost of a new press building on a site 15 miles from the main plant. Production of the highly successful Cadillac car had made manufacturing floor space critical. (It took Cadillac 48 years to build its first million cars, nine years to build the second million.) Expansion space had been used up. Needed plant changes were being made more difficult by lack of "turn-around" space—the extra floor space needed to make a checkerboard plant move, while maintaining full production.

In February, 1956, General Motors' Argonaut Realty found the old Hudson plant for Cadillac. It had adequate floor space and was close enough to the main plant (shuttle trucks make the run from one plant to another on a 20-minute schedule—even at rush hour). Employees could be transferred from the main plant without undue hardship, so labor was no problem.

And it was close to ideal in layout. Its large, high-bay area was suitable for a heavy press court. Areas with lower ceilings would be suitable for storage and machining.

But the plant was a wreck. It was full of junk—left by the previous owners. Everything from roofs to floors needed renovation. Adequate plant services, electrical power and distribution, and employee facilities had to be added. (See pages 64 and 65.)

THE DECISION: BUY THE PLANT

Cadillac's estimate of new plant construction costs and time served it well in making this decision:

• Cost of rehabilitation was 80% less than the estimated cost of a new plant of comparable size.

a dead plant, solved production problems in record time at a fraction of new-plant cost.

AND 30 YEARS OLD

• Speed of occupancy was an important factor, since the main plant's manufacturing operation was threatening to burst the seams. Cadillac took occupancy in 45 days, versus an estimated 18 months for a new building.

Now, after three years of operation, Elges and his associates have few regrets about the move. That's not to say the plant is absolutely ideal. There are some problems that could have been avoided in a new building. But, on balance, the move has proved out as a very good decision.

ALMOST PERFECT, BUT NOT QUITE

Here are a few of the problems in the renovated plant that a new plant would not have had:

• **Ceiling height** in the main press court is nip and tuck. The house crane clears the highest press with only inches to spare. This means it has to be a 25-ton crane instead of a 35-ton crane. Cadillac would have preferred the larger crane capacity, but the extra steelwork simply wouldn't fit.

Even with the lighter crane, the operator's cab is fixed at a point over the aisle. The cab doesn't move back and forth with hook, because it would bang into presses. The penalties: a more elaborate signal system between crane operators and floor men. There's some reduction in crane efficiency, but no accidents to personnel or materials to date.

Says Elges, "10 more feet would be perfect. We thought about raising the roof, but it would have been too expensive."

• **Layouts** are made in the shadow of the ceiling conformation. In some of the lower-bay areas, machines can only be located at points where the sawtooth roof is at its highest.

• **Ratio of high-bay to low-bay space** is adequate, but in any new facility most of the area would probably have been built high-bay. Of the plant's 825,000 square feet only about 250,000 square feet is high-bay.

This brought up the question of expansion. Surprisingly, there's little problem on that score. By tearing down a few temporary sheds, additional high-bay space can be readily added. And still more can be added by enclosing an existing outside court at one end of the present high-bay building. All told, there's the potential of about 25% expansion space in the present building area. And there's adequate land with the property (18 acres, total) to take care of any parking or miscellaneous outside storage needs.

• **Special areas**—made to serve the unusual needs of the former owners of the building—aren't of much use to Cadillac. For example, the plant has a half-floor above the fourth floor in some areas. Ceiling height is extremely low, so the areas stand idle, except for some miscellaneous storage.

IN THREE YEARS—LITTLE CHANGING

One proof that the plant job has been successful is found in the record of changes to date. In three years of operation, there have been some rearrangements to suit the needs of new models, but the basic plant you'll see on the next two pages is the same as it was when the renovation was completed.

Material handling is, surprisingly, not an important problem in the renovated plant. Sheet and coil stock is received through special swing doors built for the purpose. It's then stored in a section of the main press court, carried to the presses by a crane.

Finished parts are stacked on special racks for transport to the main plant. They're taken to the shipping area by fork truck, then fed (by gravity conveyor) into closed-top semi-trailers with roller conveyors permanently installed in the trailer bed.

When the truck pulls into the main plant's receiving area, it backs onto a built-up pad of concrete that pitches the trailer. The racks roll out of the truck on more roller conveyors.

Scrap handling isn't as sophisticated as in some of the high-volume automotive stamping plants, where it's all handled by conveyors running in continuous press pits under the floor. But the cost of continuous press pits—which were studied—wasn't warranted by Cadillac's volume.

Instead, scrap is collected in tote pans on the main manufacturing floor, transported to an outside bailer by fork truck. The bailer dumps about three carloads of scrap per day directly into gondolas, at the plant's railroad siding.

Having the bailer outside, says Henry B. Brawner (superintendent of maintenance), produced some problems during the first winter. Now, heat exchangers have been installed on the critical parts of the hydraulic system to keep them from freezing. "Even so," says Brawner, "it would be better inside, or at least roofed over."

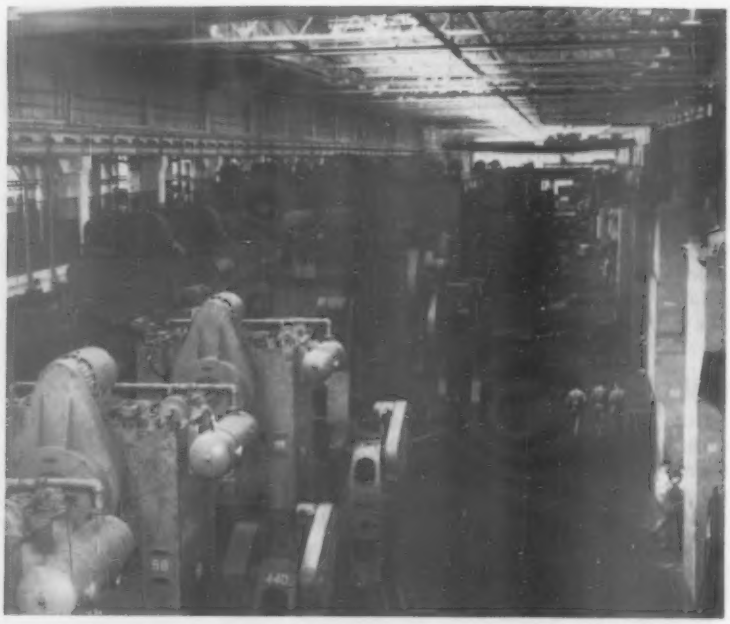
For a picture tour of the renovated plant, turn the page

◀ BEFORE

. . . Good now in production, plant services, and

PRODUCTION

One of several machining areas.



The plant's main press court, where 10 more feet in height would be perfect.

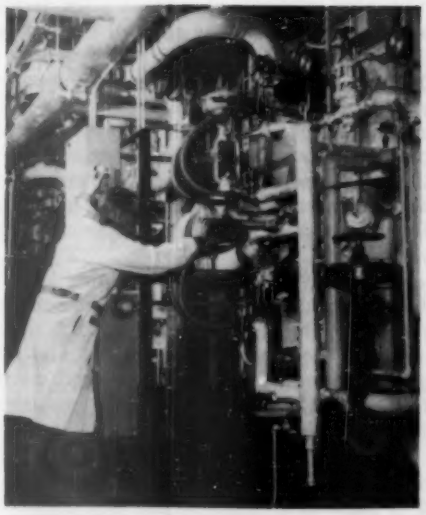
Steel storage in main court.

Shipping of hoods to main plant.

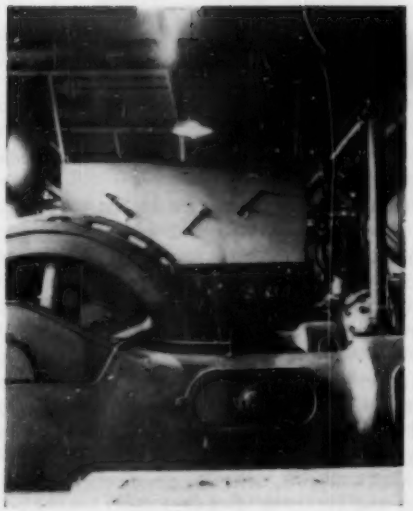
Scrap bailing outside plant.

employee facilities.

SERVICES



Efficient new power house.



Old compressor (serves standby needs).

New switchgear.

FACILITIES

Bright, clean plant offices that rival those in the newest plants.

Turn the page

New locker rooms and lavatory . . .

. . . hospital and cafeteria.

COVER PAINTING

...Good for the managers who planned it—many

The three managers above were key men in the decision to buy and renovate the old plant. Robert J. Ackerman (center), then assistant works manager, was responsible for coordinating the efforts of three departments—production, layout and tool engineering, and plant engineering. Ackerman is now works manager.

Cadillac's superintendent of maintenance was responsible for rehabilitation of buildings and property, and for moving and installation of machinery and equipment. He delegated the job to two of his assistants: George R. Elges (right), who is assistant works manager today, and Henry B. Brawner (left), who is now superintendent of maintenance.

Elges had been working on the new-plant proposition long before the Hudson plant entered the picture. So the initial job of sizing up the prospective purchase fell to him. Within a few days after hearing of the plant's availability, enough research had been done to justify a preliminary decision to buy. Here's how the initial estimates were made, and information was gathered in a hurry:

In an evening session, a three-man team, headed by Elges, planned an estimating day at the abandoned plant. They made up checklists for each portion of the building and grounds, listing every component that should be examined in detail.

The next day the team went through the building, each man separately estimating every item on the list, plus additional items they discovered on their rounds. There were some problems—such as the roof being covered with snow and impossible to examine except from underneath.

The evening of the marathon estimating job, the team of three sat down and worked up estimates for total renovation. They pooled their estimates, argued toward a group decision on each item. The next morning they submitted their report. And on the basis of this report, Cadillac's top managers agreed to go ahead with the project.

Why the rush? Two reasons. First, the property was up for sale. The men wanted a fast answer so Cadillac would have a chance to get the plant before anybody else woke up to its possibilities. Second, Elges and his men knew they had a plant problem that had to be solved—and the sooner the better.

After the initial decision, Elges and his men had time to re-evaluate their estimates. They made relatively few changes. And their estimates proved to be within 10% of actual costs.

Here are the percentage breakdowns of the cost of renovation

3% **Building exterior** was restored as closely as possible to the original condition. Brick walls were tuck-pointed; gunite walls were repaired; parapet walls were rebuilt as required; concrete columns, spandrel beams, and sills were sounded and repaired; window sash was repaired or replaced as conditions indicated. After the exterior had been restored, two coats of paint were applied to all the sash and concrete to slow down deterioration. To date, this treatment has kept maintenance costs at a minimum.

3% **Roofs** were in very poor condition. The approach here was to repair wherever possible to get roofs that would hold up for five or ten years, depending upon conditions. Areas that could not be repaired feasibly for five years of service were replaced with a ten-year type, built-up roof. Tile-roof areas were covered with a lightweight canvas impregnated with colloidal asphalt. Waterproof membranes and asphaltic paving were installed on roofs with elevator service to provide a "traffic top" for additional storage space.

33% **Building interior** was stripped of all miscellaneous steel, lumber, offices, machine foundations, etc., until the exterior walls were all that remained. The walls were given one coat of semi-gloss enamel.

The lighting fixtures were all removed from the buildings, washed, repaired, relamped, and reinstalled in an orderly pattern. The best were hung in future productive areas and the poorest in the storage areas. Additional high intensity mercury vapor fixtures were installed in the high press court. The monitor sash was repaired and reglazed with hammer wire glass, and all the broken glass in the plant was replaced with double-strength glass to match the existing patterns.

New offices were built. Partitions were added

of them are in better jobs today.

as required, although the plant is kept very "open" for maximum flexibility.

An expensive part of the interior renovation involved the pits and foundations for the heavy main press court. Cadillac decided to build gang pits—a compromise between continuous and individual press pits. In this system, from two to five presses of approximately the same size share a common pit. Presses are supported on concrete piers. This method gives flexibility, and permits line-up of presses for semi-automatic handling. With Cadillac's volume, the expensive continuous pits would not have paid off.

9% **Floors** in Plant Four were two-way reinforced concrete structural slabs. Approximately 50% of these floors were covered by wood block. The remaining 50% were waterproofed decks of poured concrete, asphalt paving block, concrete toppings, and acid-proof decks. Yet, because of water damage, little flooring could be salvaged.

Cadillac decided to remove all existing flooring materials and replace them with a new standard dimension wood block.

The wood blocks were installed diagonally to the line of traffic. Result: The bearing load is imposed gradually and taken off gradually. Blocks wear longer, hold in place better.

This pattern worked so successfully that they intend to use it in all future floor installations.

1% **Roadways** with an excellent surface of asphalt paving block existed in most of the plant driveways. A wearing surface of asphaltic concrete was installed as a topping in the heavy traffic areas to protect the asphalt block base. The topping was coated with a double application of Jenite and sand blot to prevent oil deterioration.

7% **Employee facilities** in the old plant were almost useless. There were no adequate locker-room facilities and no cafeteria. The toilets were in a deplorable condition. So Cadillac added modern employee facilities as required.

16% **Power and lighting** distribution system was hopelessly inadequate. Cadillac installed a system to provide lighting circuits at 120/208 volts, and power at 440 volts. And the following changes were made:

- Primary room: The original oil circuit breakers were removed and seven new 150,000-kva. interrupting capacity, 13.8-kv., 600-amp. oil switches were installed.
- Primary substations: New 3000-kva. unit subs fed by 500-mcm., 5-kv. cables were installed. Old transformers (they were 200-kva. units) and lighting oil switches were removed.
- Lighting distribution: Two 500-kva. transformers were installed. The original lighting-switch cabinets were retained, and 22 new distribution panels were added.
- Power distribution: A completely new system was installed: 600-amp. plug-in ducts fed by 1600-amp. low reactance duct and cables.
- D-C and hi-cycle generators: The original equipment remained except for the addition of new feeder lines.

7% **Utilities** needed beefing up, so larger service mains were installed in a number of under-supplied areas. All radiation heating was converted to fin-type, and overhead heaters were installed in the areas that needed them.

The plant air main was rerouted on the first floor level to be readily accessible to the main press court, and a new drainage system was installed in the press areas to drain the press pits. Oil interceptors were constructed in the drainage network to trap any oil effluent from the plant.

11% **Power house** renovation centered around three 38,000-lb. package-type boilers that could be fired on either oil or gas with space for a fourth, if needed.

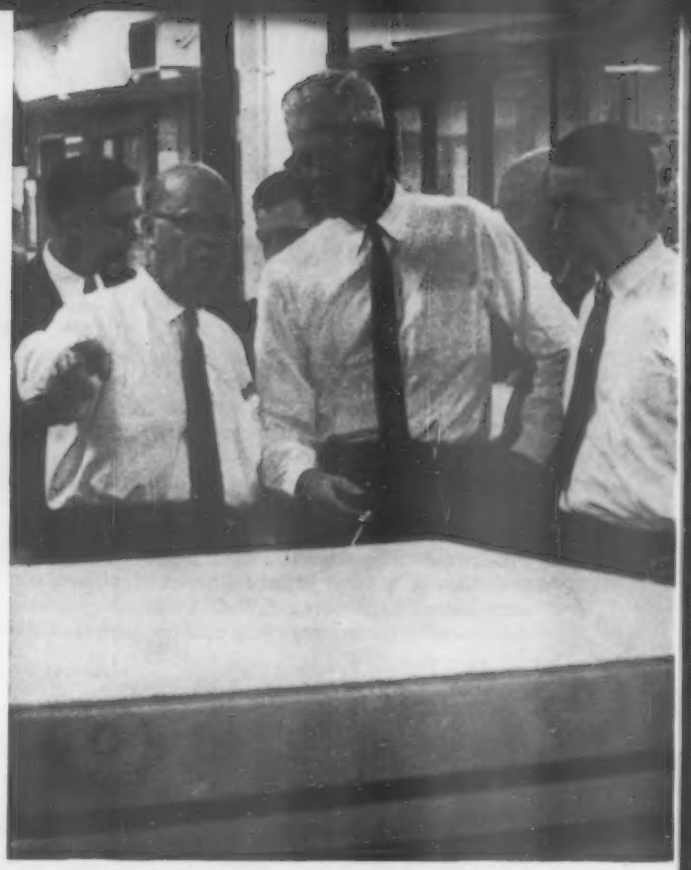
Two old 750-hp. air compressors installed at the plant were bought from the owners. They were too heavy to be profitably moved, so Cadillac bought them for a song. They're now repaired, are serving on standby.

10% **Miscellaneous items** included a number of special jobs that had to be done. Inspection and repair on the following were lumped in miscellaneous expenses: water tank, power house stack, sprinkler system, elevators, telephone service, ADT service. Also in this group were repair of railroads, removal of weeds, craneway and stairway repair, construction of new hospital.

Total cost for rehabilitation was delightfully low: 80% less than the estimated price of a new installation with a comparable floor area. There was also a huge time savings. Estimators got their first look at Plant Four in February and the appropriation request was approved Apr. 1, 1956. In less than two months, a stamping plant was underway.

Consumers Union (famous independent testing laboratory) tried out 14 expensive new refrigerators. Half required service before they could even be tested. The question:

WHAT'S THE PROBLEM IN QUALITY CONTROL?



One route to better quality: in-plant meetings of factory managers and dealers.

CONSUMERS are complaining about the quality of American manufactured goods. Not just refrigerators, but automobiles, light bulbs, missiles, sweaters. The imported fabric label is used to build sales of men's shirts. Shoppers compare some foreign toys to ours with the thought: "These toys will last—but most American toys will be broken by noon on Christmas."

In its troubles with the new frost-free refrigerator-freezers, Consumers Union admitted some of the defects could have resulted from rough handling during shipment. But "many of them could have resulted only from slipshod assembly and inadequate quality control." This manufacturing problem affects just about every plant. But seldom has there been such clear-cut proof of its existence.

FACTORY asked these questions of the appliance makers: What are the quality problems of your industry? What's being done about them? How do they apply to other manufacturers? Here are the answers:

The biggest, most frightening problem is money. It's a buyer's market now, and competition is fierce. Sales have been sharply cut; profit margins are painfully tight. An all-out price war has forced manufacturers to take every possible dollar out of the product in an effort to stay competitive. In a race like this, quality control (QC) runs a very poor second.

It's not surprising, then, that there is apathy among plant employees where quality is concerned. Or that there is a shortage of qualified men who are suited to quality work. Or that there is poor quality feedback from dealers. It's just what you'd expect.

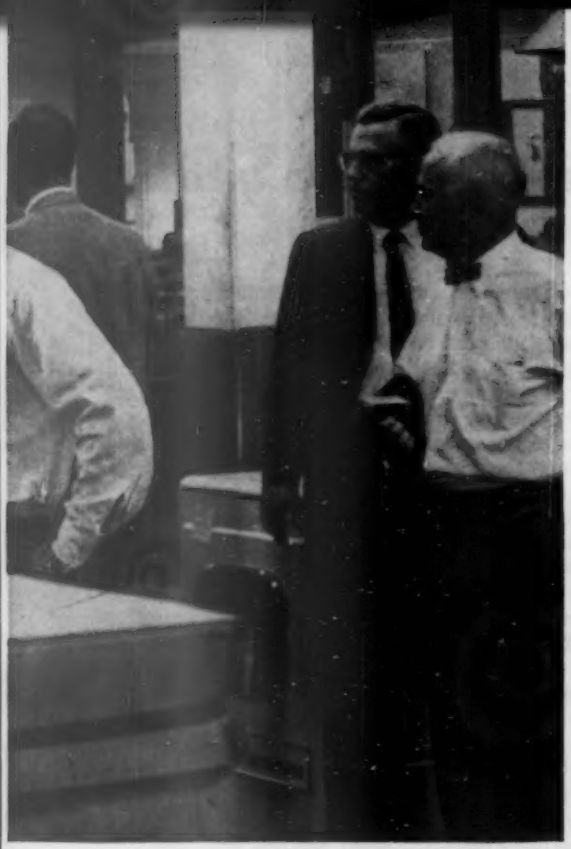
Yet all the companies we talked to said they were aware of the importance of proper quality control. And they all seemed to be doing something about it. But only one has given its QC manager actual line authority to stop production if quality falls below a certain level. And most QC managers, in this industry and others, agree that the authority to stop production lies at the heart of effective control.

It is true, however, that the situation in the industry is generally improving. And these improvements set a pattern for other industries.

The QC manager is no longer just a test supervisor charged with inspection of parts and assemblies. He has a sophisticated staff now. He earns a five-figure income. In many cases, he has equal powers with engineering, manufacturing, and marketing in planning and designing new products.

At Philco, Ray D. Sonderup is the quality control

By LAWRENCE F. MIHLON
Associate Editor, FACTORY



DEALER ADVISORY GROUPS were recently set up by Westinghouse to mend a breakdown of field-to-factory quality feedback. The three-day meetings are held regularly during the year. Objective: To find out from dealers what quality problems bother the consumer; then, with all possible speed, correct the flaws. For three days, dealers talk quality and sales with plant men. They tour assembly lines (left), inspect quality control systems, and question in-plant procedures.

manager. One of his men reports back to him from every stage of product flow, from planning and design to field sales.

If Sonderup's men find quality flaws during manufacture, he can stop shipment until corrections are made. He has similar authority if field service uncovers flaws in units still being produced.

At Westinghouse, the QC manager in each plant still reports to the plant manager. But he has full authority to impound any product or component for poor quality. This power, says Westinghouse, is equivalent to line control.

In a move toward what General Electric calls "total quality control" (FACTORY, March 1957), QC men are being consulted every step of the way.

Communications between quality, manufacturing, and engineering are being streamlined. Feedback from the field service people is being sharpened.

At Hotpoint, service complaints and reports go directly to in-plant engineering people. Quality changes are made at once. There's no wasted motion as the report passes through the chain of command.

At another company, a recent decision to automate a refrigerator-cabinet assembly line could have been vetoed by the quality man working on the project. All he had to do was show the slightest impairment of quality as the result of the new line.

In the last three years, QC personnel staff needs have jumped 10% to 50%.

Companies like G-E, Westinghouse, and Frigidaire conduct elaborate training programs for quality managers and technicians. In every instance, the appliance makers report higher pay for quality men.

The big problem, according to a G-E spokesman: Shortage of qualified men who are suited or inclined to quality work. The training programs mentioned above are to ease this shortage.

A shortage of qualified managers is not the only human problem facing quality-conscious manufacturers. At least one spokesman from each company expressed concern over the attitude of their employees.

"What good is a sharp quality system and advanced equipment, if the people in the plant don't care about quality?" said one disgruntled appliance man.

At Westinghouse, the attitude problem was considered paramount and, about a year ago, the company started an intense quality education program. In addition to the normal propaganda, employees were asked to suggest ways to improve quality control. They came up with a demerit system to rate quality. If, for example, a defect caused a service call during the first few weeks in a home it got 30 points. Lower scores were awarded to surface blemishes and non-functional defects.

The education program resulted in almost 10% higher quality on finished Westinghouse products.

All but two of the 10 companies contacted readily admitted to increased expenditures for quality control since 1957.

Westinghouse managers claimed there had been no change in its expenditure. "But," a company official said, "we've shifted funds to allow more money for parts and components quality control."

Whirlpool Division of RCA and Kelvinator Division of American Motors report doubled budgets during the last three years. Kelvinator recently completed a new $250,000 quality control laboratory.

FACTORY asked how bigger budgets for quality are justified in the light of reports of decreased sales and narrow profit margins.

"Better quality control means fewer rejects, less downtime," says one QC man.

"When production runs smooth there's greater operating margin, more profit built into manufacturing," answers a second.

"Better quality control means fewer and less costly service calls," contends a third.

"Indeed, in the era ahead," insists another plant man, "better quality control can keep you in business."

Turn the page

. . . QC men are struggling with vendor quality,

In the seller's market of the last 15 years, uncertain vendor quality has plagued every industry. The problem has been especially acute in appliance making. Now, competition, both domestic and foreign, is forcing a change.

It's reported that poor vendor quality and weak controls was a major factor in the quality collapse of the old Bendix line of home laundry products. The situation went unchecked until 1956. In that year Philco bought out the Bendix laundry operation.

Even during negotiations Philco engineers pored over Bendix machines. They uncovered some 70 critical parts and design flaws. At contract signing Philco notified Bendix suppliers that previous quality standards were out. Philco men toured vendor plants, checked quality practices.

These tough vendor controls and a streamlined service feedback network paid off. Today the Philco Bendix line is well recognized for high quality.

Since 1957 other makers, too, have sharpened their controls on vendor quality.

General Electric, Hotpoint, and Whirlpool use a vendor certificate system. With it, all vendor plants are inspected for standards and controls—before contracts are let. Once the appliance maker is satisfied on vendor quality, all parts are certified for use by the appliance plants. Further check isn't made until machine failure is traced to the vendor's plant.

Lee N. Bress, G-E quality man, quickly cautions that this certification applies to each part and to a specific production procedure. It doesn't automatically certify everything a vendor makes.

At Norge Division of Borg-Warner, vendors are kept in line with this simple but effective method: Each vendor is notified that the minute he falls below quality standards he'll be replaced by one of three or four other makers waiting on standby.

At Westinghouse, a monthly meeting of top plant men, engineering managers, and sales people is held with the five vendors holding the worst quality records. They are told that if improvements aren't forthcoming, their contract will be cut. If necessary, the Westinghouse team visits the vendor plant to advise quality control changes. Between meetings Westinghouse field engineers visit vendor facilities in search of other quality troubles.

Perhaps the most controversial topic among appliance makers (and the rest of the consumer goods field) is the annual model change.

"For it or agin it," the subject's all wound up with quality. Those who are for it are charged with planned obsolescence. Those who are against it face charges of trying to upset the American economy.

Privately, most manufacturers would like to see the annual change vanish. These same makers quietly wish for the day when they can emulate the Maytag Company. The Newton, Iowa, firm boasts a solid profit structure, good sales, and top quality. The reason, say industry wags: Maytag makes a change only when it improves the machine.

H. F. Lehman, General Motors vice president and manager of its Frigidaire Division, defends the annual model change. He contends the changes are a system that provides steady product improvement, increased consumer demand, and sharper competition.

As we said before: Whatever your side, it's all tied into quality. Critics of the model change say the more you change, the less chance you have to perfect quality controls.

Says B. A. Chapman, the executive vice president of Kelvinator:

"The yearly changeover lowers quality because each change requires a break-in period to train employees in new methods. Therefore, small failures generally occur until bugs are worked out of the new design." To prove his point, Chapman cites Kelvinator's recent decision to cut its product line, across the board, from 14 to seven models.

Another problem area of the over-all manufacturing-quality picture is field-service feedback.

In the main, appliance people measure quality control success by the number of service calls. The degree of dependence varies, but in every case the service factor figures prominently. Reason: No matter how thorough a test system may be, real quality bugs can only be rooted out after a period of operating under real conditions.

At one company, the only measure of finished product quality is a pre-set service dollar value. For example: Experience shows that to service a dryer will cost an average of $3. This figure is attached to the machine as it passes from design stage through shipment. Vigorous accelerated life tests are held on newly completed dryers before they leave the plant. All quality flaws are tabulated and averaged. If the cost of materials and labor exceeds $3, the line stops for corrective action. The same stop-action happens if real field service costs exceed the mark—while the machine is still in production.

Another large company recently went to great lengths to determine accurately what quality problems were cutting into its sales. It undertook an extensive study aimed at improving field-to-plant communications. Now, all service that's in-plant controllable is billed directly to manufacturing. A company spokesman reports the system is working well.

More reliability testing is in the cards for many plants in this industry and others.

the model change, reliability tests, reject analysis

Though it faces the same controversy as the model change, "reliability" testing seems to be catching on. It's a concept borrowed from defense contractors, where quality often is more critical than in the housewife's utility room. Military goods have to work for specific periods. And military users have to be able to plan and prepare for eventual failure.

Some appliance makers insist reliability is just a small part of quality control. They contend performance and uniformity of manufacturing are their only important concerns.

At least three of the manufacturers FACTORY talked to already use reliability tests regularly. Two others indicate moderate acceptance.

Here's how it works for a company that has used it for almost two years:

A finished product that's already quality-checked and passed is lifted from the shipping area. In determined succession it's then subjected to a series of "brutal" product reliability tests. The tests are designed to bring out the weakest point of the unit, the second weakest point, and so on.

Tests finished, the people responsible for each "broken" part or component are brought in. They must bring the part up to the "average" life expectancy of the entire appliance.

Commented a FACTORY reporter: "It's like taking a chain, finding the weakest links, then bringing the weak links up to the strength of all the links."

OTHER PRACTICES

Though not yet indicative of trends, the following quality practices are nonetheless signs of increased awareness of quality:

• At Westinghouse, a management evaluation committee (sales, service, QC, engineering) takes a daily survey of each production line. The report is sent to the manufacturing manager where a running record is kept. Any quality trouble that shows up three days running signals immediate corrective action.

• At Frigidaire, monthly meetings are held by an executive committee. In attendance are: general manager, director of reliability and quality control, works manager, director of purchases, chief engineer, the comptroller, general sales manager, manager of industrial relations. Also included: plant inspection superintendents, general service manager, and three plant managers. Quality action is reviewed and directly assigned where needed. According to a Frigidaire spokesman, the entire organization is keyed into the quality situation through these meetings.

• Philco has a unique way of assuring quality during assembly. In each appliance plant there is a reject analysis (RA) manager. He studies hourly the rejects from each parts line. On alternate hours he spot-checks the inspection supervisors for each line.

If the number of rejects from a single station exceeds a pre-set level, the RA manager has the authority to bypass the inspection supervisor and suggest quality corrective measures directly to the worker involved.

If an inspector's reject total exceeds certain pre-set marks he gets a special mark—a red line. If at any time during the day these "red lines" total, for example, three or more, the RA manager has the authority to stop production on the line until every piece gets 100% inspection. This usually makes it impossible for the line to achieve daily incentive. The effect on quality is obvious.

Philco QC Manager Sonderup confesses the reject analysis job is hard to fill. The man selected must possess unusual managerial and engineering talents. Therefore, before assignment, each candidate must pass a series of elaborate aptitude and psychological tests.

• At General Electric, the first step in "total quality control" is a product planning team. It includes: design engineer, marketing manager, quality control engineer, manufacturing engineer, purchasing manager. No design ever reaches production without approval from each man.

• At Admiral, there's a super quality control director. He reports directly to the president. Under him is the director of quality control. The super director is empowered to pull any product from the assembly line and have it tested and inspected. His authority extends throughout the company.

• At Kelvinator, the new quality control lab group is divorced from the inspection section in the plant. The 18-man force works two hours each day in the plant and six hours in the lab. Before *any* new product design goes into pilot production, the QC lab builds its own version of the unit. If the lab tests show bugs, they're removed on the spot. This method saves time and money in all pilot operations, declares a company representative.

• At Whirlpool, two company engineers are kept on the road at all times to act as vendor contacts.

SUMMING UP

Right now, consumer pressure for higher quality is felt most in industries like the home appliance field. But the "white goods" people are merely the unfortunate bellweathers of things to come in *every* industry.

As technical know-how becomes more widespread, manufacturing secrets will vanish. Quality will emerge as the measure of sales success and a primary contributor to in-plant cost savings.

Next month read about the challenge of foreign quality to U. S. manufacturers.

Do-it-yourself employment tests are on the market. But do they really do the job? Here's an expert who says a very tricky field makes...

HORSE SENSE A BAD BET IN TESTING

Photos by the Psychological Corporation

It's unfortunately true that many—too many—companies are not getting all they can out of their employment testing programs. The potential is there. Most of today's tests are more accurate than in the past, and managers are supposedly more sophisticated about using them. There should have been a marked upswing in testing efficiency, but so far there hasn't been.

Why?

Let me tell you about a recent experiment at the University of Illinois. A new test was "demonstrated" to a group of personnel managers—men who would presumably know more about tests than any other type of executive. They were asked to judge for themselves how accurate it was, by deciding how closely the "interpretations" of their tests came to describing their own personalities. The test itself was real, but the men were given *identical results* consisting of generalities that could apply equally well to just about anyone. These reports were so worded that they would reveal *absolutely nothing that would distinguish one individual from another in any way.*

The results were startling. Ninety per cent of these experienced personnel managers rated the interpretations as "amazingly accurate" or "quite good," and only 10% said "half and half." The point here is well made, and it illustrates the main reason for most program inefficiency.

There is a real fallacy in trying to evaluate a test's usefulness through personal judgment rather than objective statistics. If you make up your mind about a test by checking it against your personal impressions of the testee (particularly if you are the one being tested), you're in for trouble. *The only reliable measure of accuracy is a statistical comparison of test results with on-the-job performance.*

This attitude that "common sense" is a good gauge of a test's efficiency is widespread, as is the equally naive idea that the process can be fast and simple and still do a good job. These ideas have caused hundreds of companies—including some large, progressively managed firms—to buy tests that provide little, if any, real power of distinguishing between various kinds of people.

REASONS FOR THE PROBLEM

In a way, many managements have created this problem for themselves by steering clear of any programs that are time-consuming. Test publishers are well aware of this practice and would be something other than human if they did not cater to it in their marketing.

By SAUL W. GELLERMAN
Psychological Consultant, Harrington Park, N.J.

How to make your testing program work:

Have a test battery designed specifically for your company by qualified psychologists.

Use several tests with each employee, rather than rely on only one.

Follow up and record the job performance of everyone who takes tests in your plant.

Keep accurate statistics showing how test scores stack up against job performance.

Review your program periodically for possible updating with newer, better tests.

Have a qualified expert keep an eye on the way your program operates.

Tell your employees how and why you use tests, and how they can benefit from them.

No reputable publisher would deliberately exaggerate the power of his tests to help you pick the right people. But many are content to leave it to management to decide how much predictive power is "good enough" for its testing program.

The fly in this particular ointment is that very few managers have had the training that would equip them to make a decision of this kind. Matching a test program to a given problem in employee selection is a delicate task involving many subtle variables that aren't apparent on the surface. Because of this, an uninformed decision can result in a testing program that is *at best* only a partial solution.

When management simply chooses its tests from a catalog, or buys a ready-made test package that was designed for general use, it is unconsciously committing itself to a certain level of testing accuracy. In other words, it is going to be stuck with whatever discriminating and predictive power happens to be built into the tests it happens to choose. This may or may not be enough to handle its employees' evaluation programs in an economical, efficient way. Unfortunately, these kinds of tests are usually chosen on the basis of irrelevant factors, such as time limits or ease of administration. Instead, the choice should be made on the basis of solid evidence that they can do the specific job that management expects of them.

This is not to say that catalog or package tests won't work. They will—provided they are properly constructed and are appropriately matched to a specific selection problem. The important question is whether the particular tests that a company chooses will work *well enough* to meet its needs.

Most managers would agree that the answer to this question could only be given by a qualified expert. But because tests are marketed that encourage a "do-it-yourself" approach from start to finish, many managers aren't even aware that the question exists.

HOW MUCH ACCURACY

Many test programs are still being bought on the basis of that hoary old criterion of predicting job performance with accuracy that is "significantly greater than chance." Actually, this is the *bare minimum* that we should demand of any test. It is like insisting that there be no holes in the bottom of a canoe: it satisfies a vital requirement, but does not guarantee that the canoe will move as quickly or handle as easily as we want it to.

The "better-than-chance" label is customarily reserved by statisticians for a test that foretells performance so accurately that the odds are at least 20 to 1 against its being due to a mere streak of luck. But this does not necessarily mean that in predicting individual job per-

. . . Only economical program is the one that works

formances, the test will be right 19 out of 20 times. There is plenty of room for error, especially when the odds are based (as they should be) on a large number of testees. In fact, a test could cost you money by misclassifying a substantial number of employees and still be considered, technically, to have a "better-than-chance" accuracy.

DON'T DO IT YOURSELF

The only economical testing program is the one that works. Therefore, management should not be duped into designing its own test battery simply because tests are marketed in a way that makes this possible. Test batteries for each selection problem should be developed *jointly* in consultations between management and qualified psychologists.

An example that emphasizes the need for expert help is the case of a perfectly good test that is 'way off base an alarming number of times. When this happens, managers are often tempted to look for a new test to replace the old one, or even to throw testing out altogether. The logical step, however, is to bring in new tests to use *in addition* to the old one.

When a test is refined to the point where it yields a fairly stable measure of the trait or aptitude it's designed to measure, it frequently responds to only a narrow segment of the testee's total personality. However, this narrowness is desirable since it indicates the test is measuring something distinct and definable about the testee. On the other hand, when a specific individual tackles a specific job, his performance record is going to be determined by many *different* components of his over-all make-up.

The equation that determines how someone will react to the challenges of his job is full of unknowns, and it makes good sense to obtain measurements of as many of them as we can. The human being is so complex that there is no single part of his make-up that has enough "weight" to determine the result of the equation all by itself. No matter how good a particular test is, or how crucial the trait that it measures, it can provide no more than a partial estimate of what an employee's performance will be.

DRAWBACKS OF TESTS

Modern tests are good—sometimes very good—and are designed to measure specific capacities accurately. But this can lead managers to expect too much of them. Rather than using a faster, more valid test to replace an antiquated one or to round-out an already-sound battery, managers sometimes allow it to take over the entire job of testing. That kind of misguided enthusiasm can actually lead to a situation in which a powerful new test does a less effective job of predicting performance than the group of older and weaker tests it replaces.

Which leads us to another problem. Salesmen sometimes illustrate the power of a new test by reporting its success in one particular company. Unfortunately, this does not guarantee equal success with any other concern. This is especially true if it has been "tailored" by an expert. The modification, which may include extensive adjustment to local peculiarities, usually makes it less accurate than it was in its original form, for any other than the original group.

Management can and should control the operation of its testing program. But it should also arrange to have the critical phases of its program monitored by reputable psychological consultants.

The most critical phase of all is the design of the test battery. Management's responsibility here is to provide the test experts with as much information as possible about job descriptions, working conditions, and ways of measuring performance. The consultant's job at this point is to select the most appropriate tests he can find for the problems at hand or, if necessary, to construct them himself. Then he should oversee the initial tryouts and "debugging," set up the norms and cut-off points, and establish standard operating procedures.

MORE WORK NEEDED

But even all of this is not enough. Test programs should be followed up more or less continuously for several reasons. It will probably be desirable to tighten and strengthen the test battery after it has been in operation for a while. Nowadays job requirements have a way of changing in a few short years. When this happens, the tests will tend to give too many erroneous predictions because they will then be based on an outdated set of assumptions. Periodic reviews-in-depth by a test consultant can head off these subtle losses of predictive power.

Furthermore, the labor market itself is subject to change. This may mean that much of your future recruiting will be done among workers who differ in certain key respects from the groups on which your tests were standardized. This occurs fairly often—for example, as better-educated groups enter the labor market. Once again, the tests will have to be adjusted regularly to reflect each major change or they will wind up too far off base.

Attention must be paid as well to the personnel who do the administration and scoring. They should be trained and periodically checked to ensure that their function is being properly carried out. And there will probably be some "problem cases" of individuals whose test results do not give a clear-cut indication of their capabilities, and who will have to be given intensive, individual study.

All of these are specialized tasks calling for the sure touch of a man who has a thorough knowledge of testing in general, and your company's tests in particular. A test program that is competently monitored is not likely to lose its way in the many snares and mirages that trip up so many of the programs that are run on a do-it-yourself basis.

The easiest way for managers without advanced psychological training to go wrong on employment testing is for them to become convinced that common sense alone can guide them in running their testing program.

A *FACTORY* ENGINEERING AND TECHNOLOGY REPORT

MAINTENANCE PAINTING

NO. 9

MAINTENANCE PAINTING

- **Industry's annual paint bill is well over $2-billion.**
- **Selection of the right coating for the job is a big untapped cost reduction area.**
- **This selection is a complex problem—there are some 5000 different coatings available to U. S. industry today, each with its own proprietary name.**

The terrific costs of maintenance painting today point up the urgent need to study ways to trim them.

Since the cost of labor runs from four to nine times the cost of materials, the emphasis so far has rightly been on cutting labor costs—through new methods, new tools, and new equipment.

But there's another equally big field for cost reduction: lengthening the life of the paint job. This doesn't just trim labor costs for each job—it stretches the job intervals. It means that selection of the right coating and its proper application are critical areas in any painting program.

The best measure of the value of a paint job is the cost per square foot per year—not the cost per gallon of paint. True, a cheaper paint will often serve as well as a more costly one. But a coating that doesn't protect or endure means either an earlier re-do job or continuous patching. In both cases, unit costs will zoom out of all proportion. Moral: Take time to choose the right coating.

How can you tell what paint to select for what job? This article purposes to give you a basic guide. It will also make clear that the selection must be supported by proper painting practices to prolong the life and increase the effectiveness of any coating.

By **KENNETH TATOR**, *Coatings Consultant, Coraopolis, Pa.*

Here are five fundamental steps to help you select the right coating and get the best service out of it:

1. Study the exposure
2. Choose the right coating
3. Prepare the surface properly
4. Apply the coating properly
5. Reseal paint failures promptly

1. Study the exposure

What is your job? Is its objective to improve appearance or to protect from corrosion and other deterioration? Or to do both of these? A common misconception is that painting solely for appearance is governed by a different set of rules from painting for material protection. On the contrary, good appearance is lost as soon as products of corrosion from the base material break through and stain the paint surface, or cause it to peel or flake. There is only one set of rules that will give you economical and durable paint performance, whether it's for appearance or for base structure protection.

The demands upon paint durability vary greatly in individual areas within a plant. To arrive at the environmental requirements of maintenance paint performance, it's essential to know the four classes of exposure severity:

CLASS I—Coatings in continual contact with or immersion in water or process materials of a corrosive nature. This class primarily covers linings of process equipment.

CLASS II—Coatings for appearance and protection of exteriors of process equipment and structural materials within a process area. Here they are exposed to process fumes and vapors or to frequent splash and spillage of process materials.

CLASS III—Coatings near enough to process areas as to be exposed almost continually to moderate-to-high concentrations of fumes and vapors, but not to direct splash and spillage.

CLASS IV—Coatings primarily for appearance in yard areas and service buildings. Here they are subjected only to normal industrial exposure and weathering, with process vapors and fumes in variable but mild concentrations.

In the average plant, up to 75% of the paintable area will be in Class IV category. Half of the balance will be in Class III, with Classes I and II sharing another 12½% (if any). This is fortunate, because the rigor—and the consequent cost of surface preparation, application, paint materials—is greatest with Class I exposures. It usually decreases appreciably from Class I to Class IV.

Take a look at the relative costs. Durable protection in Class IV can be obtained with applied costs as low as 25¢ per square foot of painted surface, 40¢ for Class III, 60¢ for Class II, and $1 for Class I. These figures can vary greatly with circumstances.

Of course, any materials suitable for Class I exposures can usually handle the other classes. Thus, there is an unfortunate tendency today to "shoot rabbits with elephant guns." Oil-base or alkyd coatings at $5 a gallon will handle most Class IV and many Class III exposures, whereas materials for Classes I and II are $8 to $10 a gallon. On the other hand, operating requirements, as well as inability to make spot repairs, require more exacting surface preparation and application for Classes I and II than for III and IV. It doesn't pay to skimp on cost of coatings. But don't rubber-cover your yard fences just because rubber linings are required for your pickle tank.

Turn the page

2. Choose the right coating

Now that we've defined the job, we can consider what paint to select for it. Which one of the 5000 proprietary brands should we pick? Obviously, it is impractical to classify the performances of all these materials. But this we know: There are not 5000 different film-forming bases capable of use as protective coatings. Many of these materials are similar in their formulation. Their classification by generic bases is practical, since only 16 of such bases (listed in table opposite) are in general industrial usage today.

The classification by type of vehicle in this table is presented only as a material selection guide. As with any generic classification, it has limitations in presentation and interpretation. All coatings of a common base are not identical in characteristics and performance, because each varies in compounding and formulation from one manufacturer to another. Such variations improve performance in some instances, detract from it in others. Of course, other compounding agents, including pigmentation, do affect performance.

To pick the right coating, you first need to explore thoroughly each manufacturer's products of the type that show greatest promise for your job. Such exploration should be based on field tests conducted by you or your consultants in your own plant, or on evidence of good performance under comparable service conditions.

In the table, each coating characteristic is rated from 1 to 10—1 being the best, 10 the worst. Note that as the rating increases, "applied cost" increases, "color availability" decreases, "application latitude" (surface preparation and application tolerances) decreases, and all "resistances" decrease. And keep in mind that these exposure descriptions are necessarily broad. Hence, a specific exposure may deviate from the performance rating shown.

It may be argued that this tabulation is of academic value only, since coatings are marketed by proprietary names rather than by generic type. This is not so. More and more manufacturers are identifying products on labels and in literature according to generic types. And reputable manufacturers will always so identify their products on request.

System concept

Up to now, in talking about application of paint as a single material, I have chosen to perpetuate a common error in maintenance thinking. Actually, effective performance is always through a "paint system" rather than a "paint." The best paint finish in the world will perform poorly if applied over incompatible residues on the surface, or if the required primer is omitted, or if either is applied in insufficient thickness.

In designing a coating system, it is important that all its components display adequate resistance to the intended exposure. There is a common fallacy that non-resistant primers or other undercoats may be used, because they will be protected by the resistant finish coats. This is untrue. Discontinuities in application always occur in the cover coats. Also, mechanical injury and abrasion will sooner or later expose the undercoats to attack.

Thus, cleanliness of the surface, and designation of both prime and finish materials with respect to identification, minimum number of coats, and thicknesses, should always be specified. This concept of a painting system rather than of a paint is so proper that many maintenance engineers will tell their painter to use "System 2-C-24" rather than (as in the past) "Ajax Super-Duper Green." In this system "2" is the quality of surface cleaning or preparation, "C" and "24" the primer and finish coats, respectively.

Plant painting manual

At present there is no standard system of numerology. Each plant applies its own codes—usually listed in a painting manual. A typical manual has two basic sections: "Painting Detail" and "Painting Specifications."

The first section lists in alphabetical, cross-referenced order the important plant items that require painting. Opposite each entry is the specifications code for its paint system (e.g., 2-C-24). Sometimes the same item may be duplicated in various areas with different exposure conditions that require different paint protection. Here the manual may subdivide the paint-detail section by each area. Or it may list similar items

MATERIAL SELECTION GUIDE

Numerals represent rating of each characteristic — 1 is best, 10 is worst

COATING TYPE	Applied cost	Color availability & retention	Application latitude	Resistances						
				Weathering	Moisture	Temp.	Solvents	Acids	Alkalies	Oxidizers
Bitumen										
Asphalt	4	10	4	3	3	7	8	5	5	6
Coal tar	4	10	3	10	1	9	9	2	3	4
Oil-derived										
Alkyd	3	1	3	3	7	6	6	7	9	7
Epoxy ester	4	2	5	4	4	5	5	6	7	9
Phenolic-tung	4	3	5	4	3	5	5	6	7	9
Straight oil	2	1	1	2	10	7	7	9	10	10
Neoprene	10	8	6	9	3	4	4	1	3	2
Rubber-base										
Butadiene styrene	4	2	6	3	4	7	8	5	3	3
Chlorinated rubber	4	2	6	3	4	7	8	5	3	3
Silicones	9	7	8	8	8	1	3	8	10	5
Thermosetting										
Epoxy (catalyzed)	7	4	7	6	6	3	3	4	1	4
Phenolic (catalyzed)	7	6	8	7	5	3	3	4	7	5
Tar epoxies	7	10	4	5	3	5	5	3	2	4
Vinyl	6	2	6	2	3	6	8	2	3	1
Wax and grease	1	8	3	9	2	10	10	5	7	5
Zinc silicate	8	10	10	1	4	2	1	10	9	10

Where the above are used as latexes, or water-based coatings, permeability to water and corrosive vapors will be increased. Hence, such "latex" coatings have their special utility either as decorative finishes where the underlying base is not affected by such vapors, or as "blister-resistant" coatings over surfaces that absorb and diffuse moisture.

together in a composite painting detail subdivided according to exposures. Where the specification is the same for a whole area, the manual shows it as a unit.

In the "Specification" section, the manual contains specifications for (1) each type of surface preparation, (2) each primer that could be used, and (3) each finishing system. In my own terminology, I use Nos. 1 to 20 to identify surface-preparation specifications, alphabetical letters for primer specifications, and Nos. 20 and up for finish systems. The specifications on material applications include full details on materials and sources with acceptable alternates, minimum number of coats, and minimum thicknesses required.

A good manual should also contain color cards or designations of standard plant colors, including safety-coating and product-color identification. It should give data, both cost and technical, on proper conditions and use of surface-preparation and painting equipment. Many manuals provide explanations of the reasons for each painting operation.

Special-purpose paints

These have little or nothing to do with maintaining appearance or protecting capital investment. They have value in other ways, such as safety coloring of hazardous areas and of fire or electrical equipment, or as warning or directional signs to safety havens, exists, or passages. (Fluorescent paints are a notable example of safety coloring.) Color is also used to identify equipment and piping—with regard to type of material processed therein. (For example, for steam, water, gas, compressed air, or for hazardous materials.)

Pigments used to obtain special or bright colors are often less resistant to exposures than paints formulated for a specific exposure. Here it's a good idea first to build up protective thicknesses with paint systems suited to the exposure, then overcoat them with the special-purpose paint. Thus, only the overcoat will eventually need repainting.

Turn the page

MAINTENANCE PAINTING

MAINTENANCE PAINTING

3. Prepare the surface properly

Picking the right paint for the job isn't enough. If the paint doesn't adhere to the surface, you might as well spare yourself the cost of application. Every surface, whether steel, wood, or what-have-you, needs proper surface preparation to insure paint adherence.

The term "surface preparation" immediately conjures up pictures of sand blasting, chipping hammers, scrapers, and wire brushes. The use of such tools—even with the expenditure of a specified quantity of energy or time per square foot of surface—does not insure an adequately prepared surface. Surface preparation is an objective—the removal from the surface of all materials that are or will become non-adherent to and incompatible with the paint to be applied.

A simple dusting or washing with water is sometimes good enough. Other times, blasting to "white metal" is required. It depends on surface condition and exposure. Water, oil, and grease are incompatible with most coatings; industrial and chemical dusts are non-adherent. These should all be removed. If old paint is adherent and compatible with the new application, it may be left on. In fact, it will give added protection.

Class IV and many Class III surfaces are often adequately served by a wire brushing or a "brush-off" blast, because these exposures can effectively utilize alkyds and oil-base paints. Such paints have sufficient oil content for good penetrability and compatibility with a wide range of adherent surface contaminants. When properly inhibited they will even handle modest deposits of adherent rust. It is wise to blast all Class I steel surfaces to "white metal," and Class II surfaces to at least a "commercial blast." This is because the paint materials normally used on such surfaces are incompatible with most surface contaminants. Also, it is difficult to prolong their durability by spot repairs.

When has a steel surface been cleaned to white metal? Or cleaned to brush-off or to commercial blast specifications? The Corrosion Committee of the Royal Swedish Academy of Engineering Sciences recently published a set of standards for surface cleaning in a pocket-size book for field use. The book contains 32 photos, mostly in color, depicting steel surface appearance for each stage of rust deterioration and mill-scale failure, plus degrees of cleanliness obtained through each cleaning method. (Editor's note: The author of this article is a U. S. agent for the book.)

Paint should never be applied over mill-scale-bearing steel surface. While many paints are compatible with and adherent to mill scale, mill scale is not permanently adherent to base steel. Sooner or later, it will loosen completely from the steel, taking the paint application with it.

The cost of proper surface preparation may discourage a maintenance manager from doing the best job. Although this cost can vary widely with initial surface condition and exposure severity, it averages about one-half the cost of the entire painting job. If you want to reduce this biggest item of painting cost to practically nothing, read on.

4. Apply the coating properly

We now have to make sure this properly prepared surface will stay in optimum condition for the entire useful life of the structure or equipment.

If we keep the surface sealed with an adherent and inert barrier, its cleanliness can never alter. We'll never again have to incur the expense of surface cleaning within the maximum physical life of the paint system—conservatively estimated at more than 10 years. Too often this maximum physical life is not attained. Premature failures can reduce it to a fraction of its potential. Paint application, as well as surface preparation, should be defined by its objective, rather than by the use of tools to achieve it.

Here are three important application rules to remember:

• **A minuimum of 0.005 of an inch (5 mils) of paint barrier thickness is required for durability.** This was demonstrated in 1952 by R. R. Pierce (CHEMICAL ENGINEERING, May 1952). And coatings of bitumen or wax base require a minimum of 60 mils.

• **At least three coats are needed to apply the desired protective thickness.** A single coat seldom achieves perfect continuity, but multiple coats will insure against inadvertent discontinuities that could expose the base material to deterioration.

• **Thin coats are better than thick.** Thick, wet deposits set up high-shrinkage stresses within the drying film. With many coating materials, this causes early cracking, loss of adhesion, or peeling of the dried barrier. Thickness ceilings for each type of coating have still to be established. Meanwhile, a maximum application of 3 mils (dried thickness) per coat is recommended—unless previous experience justifies greater thickness.

The method of paint application—brush, spray, roller, flush, flood, or dip—may be decided on the basis of both economics and the attainment of paint adhesion—particularly of the prime coat. Brush application is best on rough, pitted surfaces, on fabricated steel with crevices and inside corners, or on surfaces with rough or porous, compatible or adherent residues. Other methods only lay the coating deposit on top of the surface, displacing entrapped air in the process. Slow-drying primers of good wettability and penetrability, where conditions tolerate them, aid adhesion with any application method.

We have now protected the equipment and structures from surface corrosion. And we have obtained maintenance of good appearance by providing inert, continuous, and adherent paint coverage. All this assumes that the barrier material is resistant to the exposure.

5. Reseal paint failures promptly

Well, we've now got the job painted. We may have used better and more expensive surface preparations than you usually do. We may have applied more material more carefully. And used more expensive paint materials (although, if we based material selection on classes of exposure severity, we may also have used some lower-cost materials). In all, however, the applied cost may have been more than for your painting jobs in the past. At the same time, we will certainly have obtained far greater paint life.

Once painting is completed, many plants make the mistake of giving no further attention to the job until the paint has completely failed and the unsightly mass of rust or peeling paint compels consideration of repainting. They forget such jobs require complete surface preparation at each repainting. And surface cleaning is one-half the cost of the paint job.

Our paint job, now effectively sealed against surface deterioration, will certainly be injured, scraped, and abraded in service, thus exposing the damaged surface to deterioration. Solution: Place every completed paint job on a regular and rigorous inspection schedule. This will disclose exposures of the base surface before extensive surface deterioration has occurred. And you can reseal them promptly by spot repairs.

With such a system of rigorous inspection and spot repair, costly surface preparation need not be repeated within the life period of the paint job. This will be true even though periodic application of new coats may be desirable to renew brightness of appearance, or to rebuild chalking paints up to a 5-mil thickness. Cost of a spot repair or repainting job will be one-half that of a job requiring surface preparation. What's more, the long-term protective cost of the entire paint application will level out toward a total cost one-half that of protection requiring repeated surface preparation. Additional savings through increased paint life will accrue through your use of better selected materials and greater protective thicknesses—which will mean fewer jobs at longer intervals.

Be sure you get these benefits. Good specifications won't guarantee them. Assign an inspector to see that all specifications are followed, and all failures promptly remedied.

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PREDICTION FOR 1961: A HEADLONG RUSH

New vending machines extend range of mechanized service for in-plant feeding

BILL CHANGER: a "brain" that rejects counterfeit currency, too (ABT Mfg. Co.).

ALL-PURPOSE VENDOR: sandwiches, salads, fruit, milk, juice—you name it (Rowe Mfg. Co.).

HOT FOOD PLATTER: entree and vegetables (Continental Industries).

TOWARD MECHANIZED CAFETERIAS

Vending machines now serve employees in 80% of the plants surveyed. But new machines will improve service and speed up the trend.

VENDING MACHINES served a complete lunch to employees shown at left. Anyone would call it a good lunch. And anyone could find items in the "menu" to suit his taste. Mechanization of plant cafeterias with coin-operated vending machines is today's fastest-growing industrial trend.

A recent survey by the Paper Cup and Container Institute shows:

- 20% of the plants questioned depend entirely on automatic equipment in their cafeterias.
- 80% of the plants use some vending machines for in-plant feeding.

In their search for this year's Top Plants (to be named in the May 1961 issue), FACTORY's editors have found vending machines in every new plant they have checked so far. Many plants—especially the smaller ones—have nothing but machine-served lunchrooms.

Last month the manufacturers of vending machines exhibited their models, old and new, in Miami Beach. The National Automatic Merchandising Association says its 14th annual show was the biggest and best of all.

A FACTORY reporter toured the show, checked each of the 136 exhibits. There isn't enough space to describe every new and useful machine in the show. But a few are particularly noteworthy. For example:

- Automatic bill changers exchange silver coins for $1 and $5 bills, thus eliminating the need for cashiers.
- Vending machines that "cook" at the drop of a coin provide hot dishes in seconds. They serve individual dishes, such as chili con carne, or platters of meat and two vegetables. Other models toast sandwiches.
- Coffee vendors freshly brew and serve each cup of coffee individually in a few seconds. It's a new approach to coffee vending, one that overcomes the objections of many people to machine-served coffee.
- Versatile vending machines handle a variety of foods requiring refrigeration. One machine can serve a complete cold meal including fruit juices, sandwiches, salads, milk, fresh fruit, and other desserts.

Some of the unique new machines are shown below. Used with the standard types now available, they could help you solve your in-plant feeding problems.

COLD SOFT DRINKS: made with finely crushed ice in every cup (Rowe Mfg. Co.).

CAKES AND PASTRIES: desserts or just snacks, plain and fancy (Rowe Mfg. Co.).

FRESH-BREWED COFFEE: made one cup at a time in a few seconds (Demay Inc.).

SILICON CONTROLLED RECTIFIERS

Tiny, powerful, maintenance-free, these new solid state industrial devices can outlast the machines they control.

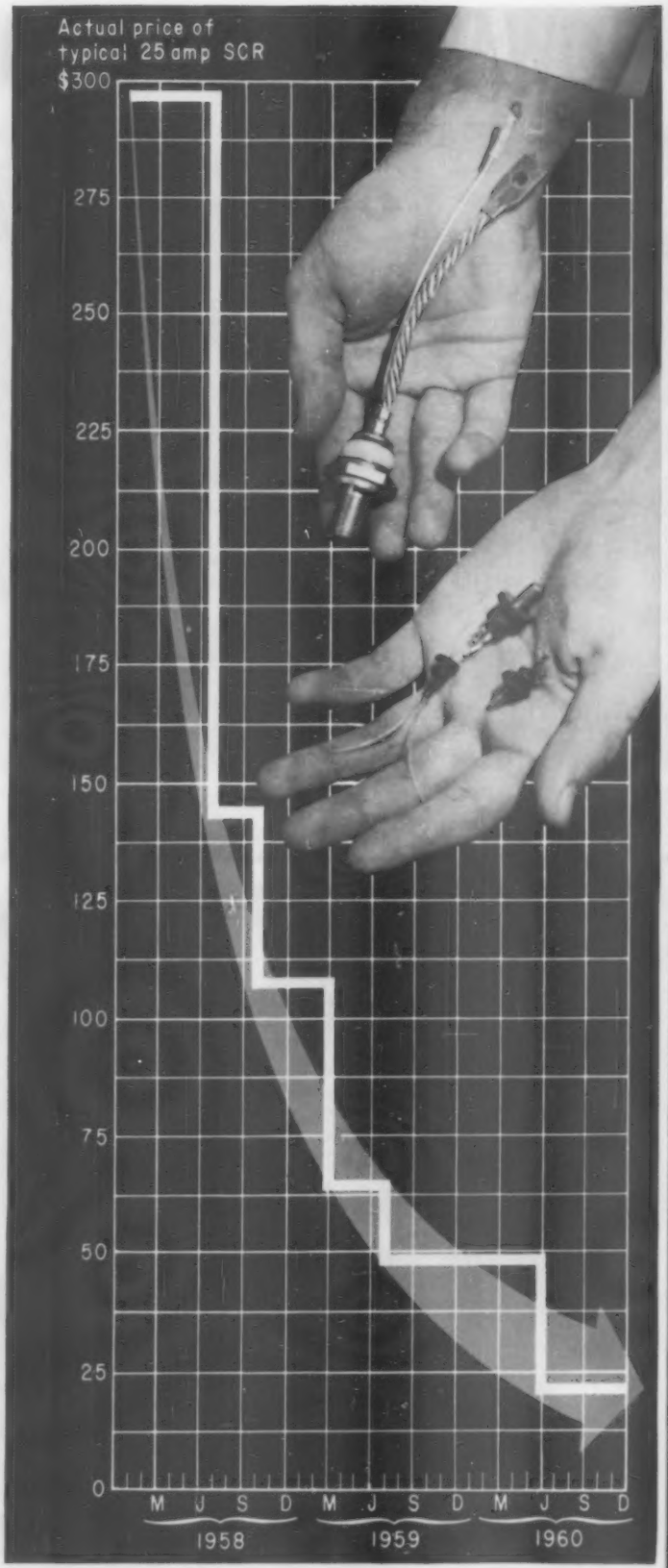
Three years ago the silicon controlled rectifier (SCR) was a laboratory curiosity with nothing for plant men but promises.

By mid-1961 almost every manufacturer of heavy-duty automatic controls will be supplying SCRs in some or all of the electronic controls you buy. Prices of the units continue to drop—they're now less than 10% of what they were in early 1958 (chart, right). Users report that SCRs perform as well as their developers had predicted.

Here's what you should know about the SCR:

- It's a rectifier—good as the best silicon diodes.
- It's a control—capable of throttling kilowatts in stepless increments from zero to full power.
- It's maintenance-free—except for visual inspection and blowing off dust.
- It lasts indefinitely—there's no filament to burn out, nothing to deteriorate.
- It's efficient—losses are only a small fraction of those in the conventional thyratron tube.
- It's instant start—with no filament to warm up.
- It's small—takes far less space than any equivalent control device.

The SCR is a new kind of semiconductor—"big cousin" to the transistor. "Big," because it can



Industrial SCRs handling 50 amp. at 500 volts are already available. A few sizes offered by General Electric (first to develop SCRs) are shown at right. Other producers include Texas Instruments, Motorola, Transitron, and International. Westinghouse expects to offer 400-amp. units early next year.

switch and rectify kilowatts instead of watts like the biggest transistor. "Cousin" because it is in the semiconductor family. But it's "grown" differently: After the silicon semiconductor heart—much like that in a transistor—is grown and shaped, it's grafted to antimony and aluminum elements to become an SCR. This almost microscopic change in construction gives industry a totally new kind of control.

SCRs WORKS LIKE THIS . . .

The heart of a typical SCR is a wafer-like sandwich of silicon ⅒ to ½ inch across and 0.010 inch thick. Electrical contact with one face (the cathode) of the sandwich is made through a layer of gold antimony; with the other (the anode) through a wafer of aluminum. A third contact (called the gate) is made with the top layer of the silicon itself. With no voltage on the gate, the silicon sandwich acts as an insulator, preventing flow of current in either direction between the cathode and anode.

However, if the gate terminal is made electrically positive and the cathode negative, a few thousandths of an ampere will flow through the gate circuit. This "trigger" current completely changes the "state" of the silicon, turning it from an insulator into a conductor. If the anode is electrically positive, current will flow from cathode to anode. As long as anode-to-cathode voltage remains high enough to keep a "holding" current flowing, the SCR will continue to conduct regardless of gate voltage. Once current drops below the "holding" value, the semiconductor becomes an insulator again. When the voltage is reversed (i.e., cathode positive, anode negative), no current can flow regardless of gate voltage.

So the SCR is a rectifier capable of conducting or switching heavy currents, controlled by a few milliamperes of trigger current. This function is almost identical to that performed by a thyratron tube. However, the SCR fires (conducts) when current flows through the gate, whereas the thyratron fires when voltage is applied to the grid.

TO DO THESE JOBS FOR YOU . . .

There are dozens of ways to make use of the SCR right now in industrial controls. Take an obvious one —controlling the speed of a d-c motor. If one (or more) SCRs are connected in series with a d-c motor fed from an a-c power line, and the gate is energized at normal level, the motor will receive full rectified voltage, except for a very small drop (typically one volt) in the SCR. However, if the gate current is reduced through a simple manual (or automatic) control, the a-c voltage must reach a higher point in each cycle before the SCRs begin to conduct. Thus the current can be varied from a maximum flow to a series of widely separated pulses—or to no flow at all.

But d-c power and control for variable speed drives is only a start of the potential applications. SCRs have already made a successful debut in commercial light dimming. They should be ideal for crane motor control and for automatic field voltage control of a-c generators. Frequency changing appears to be a natural application.

Let's look at some of the other advantages of the SCR, comparing it with other equipment doing the same job:

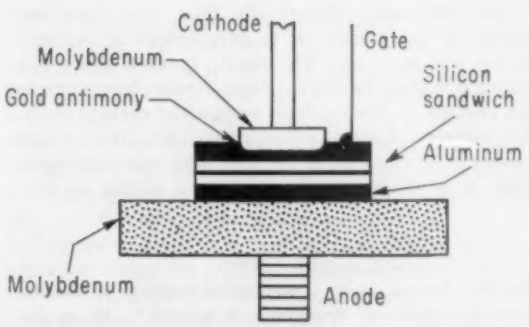
- Variable voltage for d-c motor speed control up to now has generally been supplied from thyratron tubes in the small-to-medium horsepower ranges and from various combinations of motor-generators, rectifiers, magnetic amplifiers, and thyratrons for large motors. The typical "package" drives use a combination of two or three of these means, depending on manufacturers and ratings. But SCRs (with auxiliary devices) can replace all four components now, where loads are within available ratings.
- Unlike thyratron tubes, SCRs aren't subject to damage from mechanical or thermal shock, and can be mounted in any position.
- SCRs consume far less space than magnetic amplifiers, which control a-c only. For controlled d-c, rectifiers must be added.
- The advantages of static SCRs over motor generator d-c sources are many. Noise, vibration, foundation, maintenance, and eventual repair or replacement are eliminated. Initial costs are often less. SCRs are unaffected by dust, corrosive fumes, or moisture.

BUT THEY DO HAVE LIMITS

- SCRs are still relatively expensive. Too often control engineers have found that if circuit demands do not match available SCR ratings, using two in series (to solve an overvoltage problem) or in parallel (to solve an overcurrent problem) makes the price tag too high, regardless of other advantages.
- They don't have the built-in reserve capacity users have come to expect of electrical and electronic equipment. There's very little "cushion" in SCR ratings. Operating them beyond temperature limits (typically 100 to 150 C.) is risky. You can't run an overheated SCR control "for just a few minutes until the emergency is over." Once an SCR has failed, there's no repairing it.

How does the SCR affect plant operations?

For answers, we talked to one of the leading engineers in the field. For his reactions, turn the page.



Internal Construction of Typical SCR

In this exclusive interview, G-E expert Von Zastrow (right) examines effect of the SCR on your plant operations.

Mr. Von Zastrow, what do you consider the most important advantages the SCR offers plant production, engineering, and maintenance?

Reliability is the point that appeals to most plant people. The fact that SCRs don't deteriorate in use, take abuse, and need only the most casual kind of inspection means more to manufacturing users than their small size and high electrical efficiency.

Just how much maintenance do SCRs require?

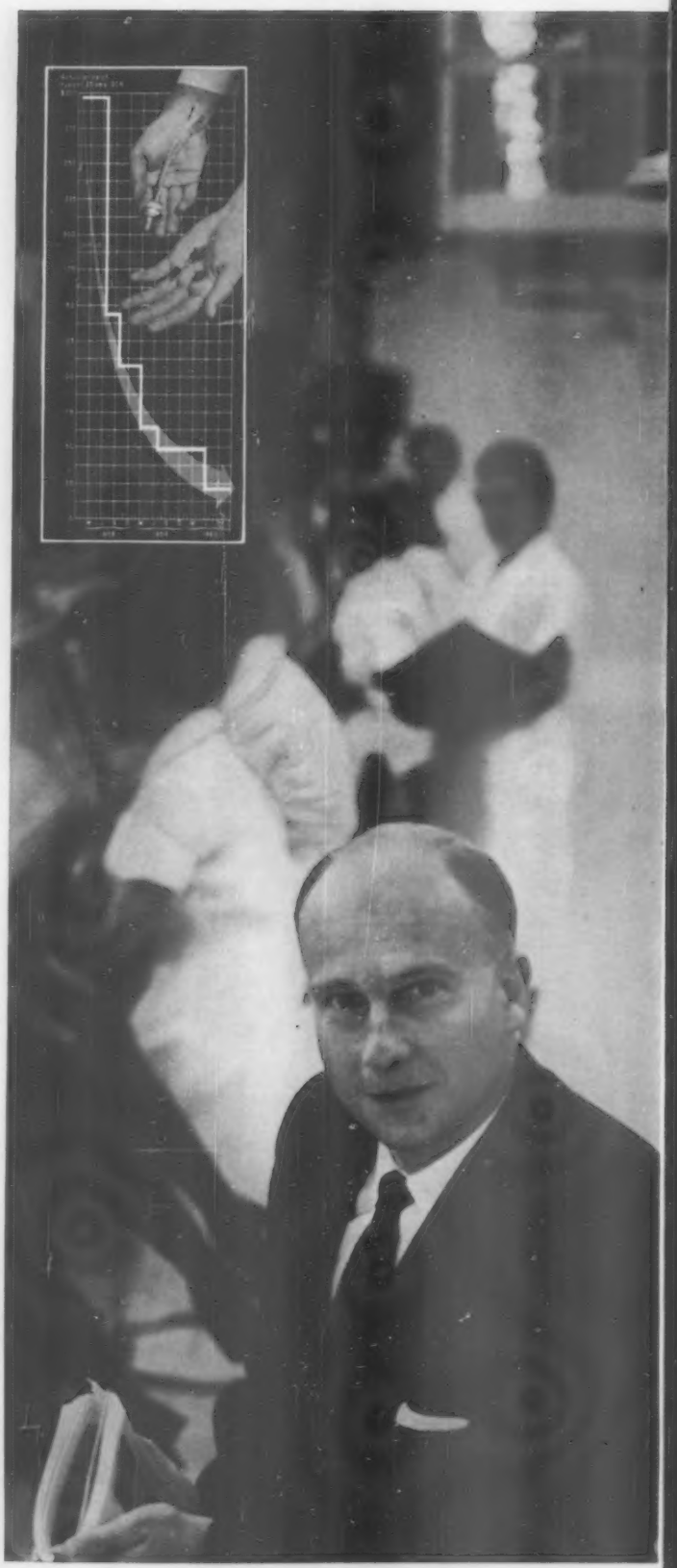
As long as nothing changes in the circuit surrounding the SCRs, and assuming the circuit is properly designed, there should be no need to do any maintenance whatever except to see that the SCRs aren't overheated by nearby equipment or by dust piling up on the cooling fins.

What about the control equipment built around the SCRs? How much maintenance will it require?

Surrounding the SCRs will be the same capacitors, resistors, transformers, and chokes that control circuits have always used. These are all static devices that should last indefinitely. However, we all know that no component is absolutely reliable and that these circuit devices deteriorate or change value occasionally. When they do, they need replacement—and so may the SCRs if they are overloaded as a result.

Do you mean that SCRs never fail unless some other component fails first?

Not necessarily. Essentially, there have been two causes of the failures we've experienced in service: surges and moisture. The most common cause has been the voltage or current surge coming from outside the control or from a fault within the control itself. For instance: Under certain conditions, line voltage can increase many times for a cycle or two from lightning or switching surges originating within or near



Etto Von Zastrow (right) is application engineer at General Electric's Components Department, Auburn, N.Y. He specializes in helping industrial designers apply silicon rectifiers.

the plant. Unless the control circuit is designed to keep surges from reaching the SCRs, they (and the other components in the control) may fail.

Moisture is the other big enemy of semiconductors. You have to seal it out completely, and for good. With the latest semiconductor manufacturing methods, equipment, and quality control procedures there is practically no chance of a defective SCR getting out of the maker's plant.

How uniform are SCRs? When something goes wrong, will the replacement unit be an exact duplicate of the one removed, or will maintenance have to make circuit adjustment every time an SCR is changed?

You'd have to get the answer to that one from the manufacturer of the particular control involved. We publish guaranteed operating parameters for almost every significant characteristic of the units. If the control designer uses "marginal" circuits, the control may need adjusting when an SCR is replaced. But I think you'll find this an exception. Most industrial controls by reliable manufacturers use circuitry that allows for normal component variation.

How about the standardization among SCR manufacturers? In an emergency, can a plant pick up replacement SCRs from any nearby distributor without worry about manufacturer, as it now does with tubes?

Yes, probably. For instance, you can buy SCRs rated 10 amp., 200 volts, from different manufacturers, and they may have small, though important differences in characteristics, such as turn-on time or short-time overload capacity.

There are many control circuits where these differences between SCRs of different manufacturers won't interfere with interchangeability. However, it's a point that maintenance people should check before buying control equipment. Semiconductor manufacturers are working toward greater standardization. And availability may not be much of a problem because both control manufacturers and electronic suppliers are already maintaining local SCR stocks.

What do you see for the future of SCRs?

We have to remember that SCR's are only at the beginning of their development. Ten or even five years from now we may be making SCRs by altogether different and simpler methods. As far as improvements are concerned, the areas in which we're working hardest are higher voltage and current ratings, faster turn-on and turn-off times, and reduced manufacturing costs. We're convinced that improvements will continue to come along fast.

What about the plant that wants to build its own control equipment, using SCRs? Is it feasible?

Yes. Some plants have done it successfully. They wanted a special type of control that was unavailable at the time, or not feasible to buy from control equipment manufacturers. There's no good reason why some plant engineering departments can't build control equipment to solve special problems. For anyone who is familiar with electronic circuits, applying SCRs is no more complicated than applying conventional thyratrons. In fact, it's often simpler.

When a designer works out a circuit using SCRs, he will probably want to go all the way, using all static devices to reduce maintenance problems. So, ideally, his application know-how should also include transistors and magnetic amplifiers.

We have published a big manual on SCR application, which shows circuits for dozens of different control functions. In it, the problems of protecting SCRs against overloads and faults are dealt with in detail. And we have a staff of application engineers working on circuit design problems.

However, before deciding whether to build or to buy standard or special-purpose controls, plant people should give serious thought to all the advantages the experienced control manufacturer can offer.

What are the problems of protecting SCRs against overload and faults?

Users have to remember that the mass of copper, iron, and insulation in magnetic components serves as a cushion for current and voltage surges that are many time normal operating levels. SCRs don't have this "built-in" cushion.

The key ratings (non-recurring and continuous voltage and current) represent the actual test limits of production units. This means that all ratings must be considered as maximum (or minimum, as the case may be). Of course, in any given production run, some of the SCRs have greater overload carrying ability. The trouble is, you never know which ones these are.

Because of their relatively short-time overload carrying ability, SCRs have to be protected by devices that have tripping characteristics carefully matched to the semiconductor. The heat build-up developed within an SCR during an overload may not be the same as that within ordinary fuses or circuit breakers. Fuses will have to be of the current-limiting type. Breakers will need to be fast-acting.

A final point: Because SCRs need protection, don't think they lack durability. Most SCRs will still be working long after the machines they originally controlled have been shipped off to the scrap yard.

What about the price picture? Do you expect any big change here?

Yes, you may expect to see some further reductions. For instance, we have been able to reduce prices by as much as 92% in three years (see graph, page 82). Price of semiconductors like the SCR depends on volume and on improved manufacturing methods. As volume reaches the level that it has on some electronic components (transistors are a good example), and we can take advantage of increased mechanization, we can expect further price reductions.

Remember that we're not too far away from big consumer usage for SCRs—in lamp dimming, speed and switching control of appliances, and residential heat control. When these applications get going, volume will really build up.

Here's a concept that turns plant statistics into decision-making tools—and hardware. It can help you get...

MEANINGFUL MANUFACTURING

If you're getting too many reports—and not enough information—on manufacturing costs, this is what you need. It's a remarkably simple technique that can provide penetrating insights into manufacturing costs. Based on grade school mathematics, it's called Ratio Analysis. Here's how it works:

Assume you get a weekly report of maintenance expense. This in itself doesn't evaluate maintenance economy. But if this expense is related to the number of hours the machinery ran in a week, you have a performance for the maintenance expense. And you can construct a ratio to show maintenance cost per machine running hour.

Running hours is not the only fact that can be related to maintenance expense. It might be equated against direct-labor hours and the ratio will then show the maintenance expenses per direct-labor hour. Maintenance expense might also be related to the total downtime to show the effect the quality of maintenance has on keeping machines running. While the maintenance expense may rise, it should effect a drop in downtime (due to maintenance) that more than justifies the increased costs.

Obviously, your weekly maintenance figure takes on much more meaning when it is compared—in ratios—with the other plant statistics it influences.

Similarly, hundreds of other meaningful ratios can be constructed from data available in almost every well-organized plant. Let's examine a few of the most useful ones:

INDIRECT USAGE RATIO

$$\text{FORMULA : } \frac{\text{Total indirect labor hours}}{\text{Total paid hours}}$$

This ratio pinpoints the portion of the gross paid hours spent on indirect labor by showing the indirect labor effort in relation to the total payroll. It's a ratio useful to smaller companies when starting a ratio-analysis system.

In this type of ratio, management can see the effect of increased activity on the indirect-labor expense portion of factory overhead. This is one of the items that has to be evaluated when expansions are planned. Since people are employed as whole bodies, increases in this ratio with higher volume will be manifested in steps rather than in smooth curves. A foreman supervises 25 people as well as he does 20, but when 35 people are engaged, then an additional foreman possibly has to be employed. In deciding on the expansion, the break point has to be determined. This might be 32 people. At that point, then, all cost increases have to be evaluated and compared to the gains estimated from the expansion.

GROSS PRODUCTIVITY RATIO

$$\text{FORMULA : } \frac{\text{Earned direct hours on standards}}{\text{Clock direct hours on standards}}$$

This ratio compares the *actual* hours (by the clock) that were spent on incentive-rated operations and the *equivalent* hours that were earned as a result of effort applied to obtain a bonus. It evaluates the percentage of additional hourly pay being earned by workers on incentive or measured direct operations. And it shows the efforts being put forth by the workers as measured against a work standard. If a measured daywork plan is in effect, the usual productivity attained will usually be under 100%.

The ratio also measures the fairness of the production standards: If workers are putting forth an equitable amount of effort and the productivity remains low, this is evidence of "tight" standards (i.e., standards that make too much of a demand on workers). Conversely, a high productivity figure does not necessarily mean high effort. It may mean the work standards were set too "loose," making the goal of a fair day's work easy to attain. In any event, an incentive recovery statement will quickly test the equity of the plan. Productivity is based on the fact that 100% is the pace at which the workers earn their full base hourly pay rates with no subsidy being paid by the company. This ratio is too narrow for appraisal of plant economy since it doesn't reveal the number of applied direct-labor hours subjected to the increased productivity.

For example, assume a factory uses 1000 hours of direct labor a week, 20 of which are covered by work standards. On these 20 hours, 150% productivity was attained, which means that the factory got the benefit of an additional 10 hours of direct labor and that the 20 clock hours became 30 earned hours. Comparing that 50% increase on 20 hours to the total applied time of 1000 hours, the gain is insignificant—except for the fact that the company knows this kind of result is *available* if pursued properly. It is obvious then that 150% productivity on 20 clock hours is not as positive as 110% on the

without expensive

DATA

IF YOU WANT TO:	USE:
Start a ratio analysis	Indirect usage ratio
Measure production standards	Gross productivity ratio
Evaluate maintenance quality	Maintenance effectiveness ratio
Pinpoint a lack of planning	Excess direct-labor cost ratio
Check estimated set-up times	Set-up index

1000 hours. A proper appraisal of productivity is one that includes coverage and the losses due to subsidizing substandard workers.

MAINTENANCE EFFECTIVENESS RATIO

$$\text{FORMULA} : \frac{\text{Total maintenance time}}{\text{Direct labor on standards (earned)}}$$

This evaluates the effect of the quality of maintenance on productivity. It often climbs when maintenance men are not included in the incentive. In one electrical products plant, an assembly line of 23 people was stopped for an entire day while fairly minor repairs were being made. The line was on a production incentive that normally allowed workers to earn about 125% for the full day. This meant some workers lost two hours of premium pay while they were assigned to "make work" jobs. Others were sent home for the day at a cost to them of 10 hours' pay. This indicates it would have been better to include all indirect workers in the incentive.

EXCESS DIRECT-LABOR COST RATIO

$$\text{FORMULA} : \frac{\text{Excess direct-labor costs}}{\text{Total direct-labor costs}}$$

This ratio indicates how many more cents should be added to the existing direct-labor dollar to pay for direct-labor excesses. This control shows to what extent equipment and material troubles prevent the full application of standards.

Therefore, this ratio gives management the opportunity to investigate how well a foreman is scheduling or how well it is being done for him. Excess direct labor costs are generally caused by waits for material, for instructions from the foreman, for getting tools, for set-up completion, for work orders, etc. A lack of planning or supervision results in a fairly high figure in this ratio.

SET-UP INDEX

$$\text{FORMULA} : \frac{\text{Set-up hours}}{\text{Total direct-labor clock hours}}$$

Here's a ratio that shows how much set-up time is required for each direct-labor hour. It is best applied by department or to groups of similar machines. It refers to the time the set-up man takes to make the set-up and *not* the time the operator spends waiting for it to be completed. It's mainly a measure of set-up productivity and is really not considered a loss item. It's valuable in checking out the set-up times estimated. The effect of set-up time on over-all production can be seen by relating this ratio to the number of running hours of equipment. Obviously, as set-up time increases—especially if the operator's waiting time is added—the time available for running is reduced. This ratio shows the general movement between the two.

But what about the quality of the set-up? This is easily taken into account if you assume that a quality set-up allows the operator to proceed without interruption, secure that the set-up won't come apart at the seams. Therefore, the second factor in the evaluation can be the average productivity of the machines worked on.

BUILDING BLOCKS TO BETTER CONTROL

Despite the fact they can be extremely useful, the ratios discussed above are the simplest kind to construct. They contain only two variables. Others, increasingly complex, can be built by using more variables or by comparing one ratio with another. The more complex the ratio, the more general its usefulness tends to be.

For example, a plant manager probably would not be concerned about the downtime ratio in the spot welding department; he would be much more interested in the plantwide figure. The downtime ratio that would supply this information is obviously a complicated one that includes a number of factors.

Want to know more about ratios and what they can do for you? The whole concept and application of this new system, including higher-order ratios, will be explored in depth in a book to be published next month. Its title: *Managerial Control by Ratio Analysis*. The author: Spencer Tucker. The publisher: McGraw-Hill Book Company, Inc.

"Any plant manager who hasn't looked into packaging improvement in the last three or four years is losing money"

Harold J. Anderson, Headquarters Manufacturing Planning, Westinghouse

A profit plan for in-plant PACKAGING

"Packaging is peanuts," say some plant managers. Savings aren't worth the cost and trouble of digging them out.

If *you're* inclined to think of packaging costs as a nickels-and-dimes proposition, consider this:

Damage claims by common carriers in this country total $165-million every year. This does not include the cost of handling the claims or the cost of losing customers. And it ignores the cost of packaging itself—materials and labor, both multi-million-dollar activities. Poor packaging is probably a billion-dollar headache, nationwide.

The other side of the coin is the costly temptation to *over-package* an item in response to a customer complaint.

Spending $50 for a crate is money down the drain if the basic problem isn't with the package in the first place. You can spend too much in many ways—using the wrong material, using inefficient methods, using material that is heavier or bulkier than it has to be.

And don't overlook the sales appeal and advertising value of a well-designed package. It's seen by a lot of people.

If you're still not convinced that engineered packaging can give you some man-sized savings, look at some of the gold being mined by Westinghouse:

SAVED: $56,000 the first year on packaging of large motors.
HOW: Replace a wooden crate with a paper container. Saves weight, labor, space, and handling costs.

SAVED: $10,000 on dehumidifier packs.
HOW: Re-design inserts to use less material.

SAVED: Over $300,000 on export refrigerator packaging.
HOW: Production-line packaging of export refrigerators in a special fiberboard container.

SAVED: 50% on packaging and handling of small motors.
HOW: Ship 96 motors as a palletized unit.

Turn the page

Smart design of this re-usable container (right) is saving a fortune at Westinghouse. Here cover is lowered over airborne radar system just before shipment. The frame acts as an assembly fixture during manufacture, then doubles as a test stand. The entire unit is mounted on wooden skids for ordinary lift-truck handling. Dolly shown here is used for movement within the shop. Entire metal container meets strict military specs, and includes an air relief valve, a humidity sensing unit, skids, lifting eye.

Packaging costs were cut 10% by the switch from the old hand-loaded carton (upper left) to these new break-apart boxes for flash bulbs. Competitive advantage is also gained, since a merchant can sell as few as six bulbs without destroying package. Bulbs are packed loose in the new boxes, poured out as needed. Each box is about the size of a cigarette pack.

Almost $4000 a year is being saved with this clever new insert for toaster cartons. Shown in use below (left), it uses less material and is easier to assemble than the old cut-and-folded insert shown beside it. Carton itself is smaller, since new insert takes less space. Savings per pack: 29%.

A CONTINUOUS SEARCH, PLUS . . .

Westinghouse knows you can't get results like these, year after year, without an organized and continuous effort. Three years ago, a headquarters manufacturing planning staff was set up to coordinate plant-level programs. The staff assists the corporated packaging committee, guides plants with special problems, and keeps them informed of new packaging materials and methods, symposia and meetings, and selected literature. One sure-fire idea: the "Packaging Memo," edited by the staff and distributed to all plants. The memo, in effect, cross-pollinates packaging ideas. With descriptions and photos, it tells what was done previously, what the new idea is, what savings resulted, and who was responsible. It's published twice a month.

WRING-OUT PROGRAM . . .

The objective of the Westinghouse program is to wring costs out of packaging. Goals include reducing damage, storage expense, material handling and freight charges, and vendor's packaging costs.

There's a constant search for ways to:

- Use less of present materials.
- Use other, more suitable materials.
- Use better methods.

At each plant, there is a permanently assigned packaging engineer. At larger facilities, there may be two or three; at smaller ones, it may be only a part-time responsibility. Point is, responsibility *is* pinned down, specifically, at each location. This places initiative in the hands of men living with the particular problems at each plant. This plant-level action is important, because Westinghouse products range from transistors to mammoth transformers; from powders and liquids to solids; rugged, fragile, tiny, bulky—even radioactive.

GIVES A SOLID PAYOFF

It pays to pay attention to packaging, as the examples on these pages show. And for a more spectacular example, look at the jackpot recently hit by the packaging engineer at the company's Columbus (Ohio) appliance plant:

He redesigned the package used for refrigerators, eliminated two pads formerly needed to hold the door closed, eliminated the steel banding used to hold the pads in place, and slashed the labor cost involved.

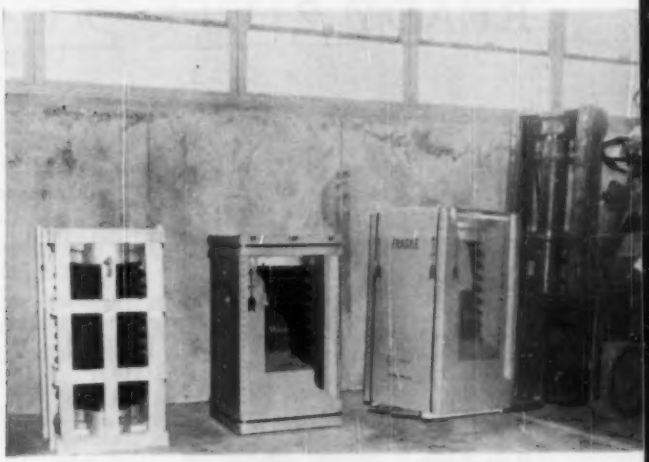
Net savings: $250,000 a year.

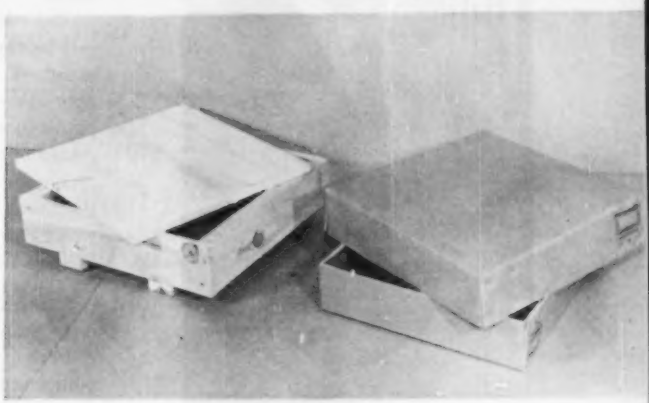
While saving over $7 a unit, shrewd packaging of refrigerators also enabled Westinghouse to make successful re-entry into export market. Conventional, wirebound wood overpacking was too costly, and normal domestic packages were being badly mauled by overseas shipment. Here, W. W. Tinapple (right), packaging engineer, explains features of the new package to Gordon V. Hennis. The new container is made of triple-thick corrugated, and uses special grades of paper and adhesive.

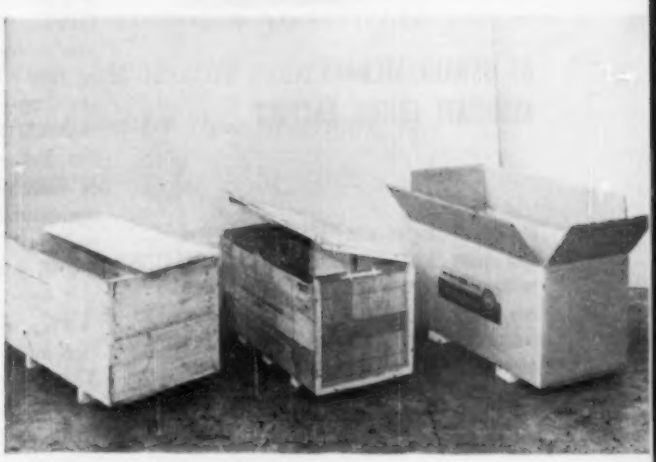
Savings of $5000 a year were effected through a new package for heavy, ceramic SVS arrestors **(top photo below)**. Wooden crate (left) evolved into skid-base carton (right) in six months.

An 80% reduction in the cost of packaging small parts for power transformers **(center)** resulted when Westinghouse switched from wooden boxes to a laminate of paper and polystyrene foam (it's made by St. Regis Paper Company).

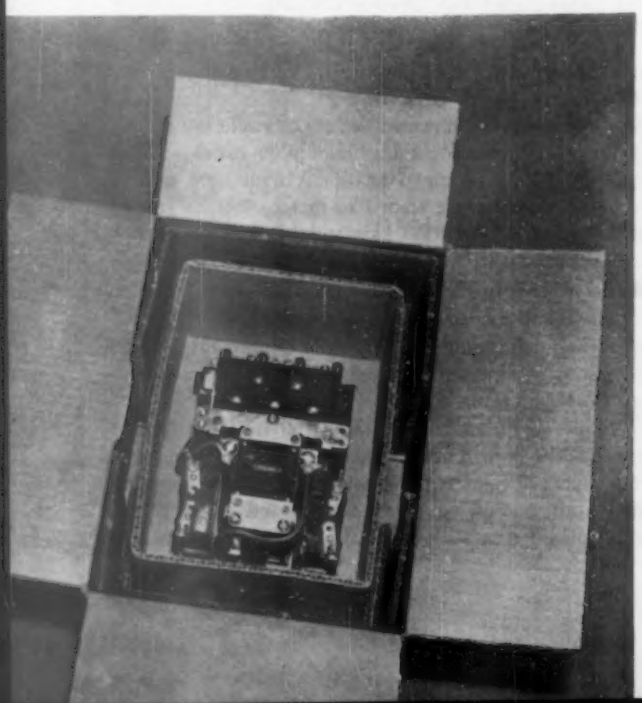
Over $7000 a year is saved by progressive improvement (from left) of general containers **(bottom)**. Bonus: trademark space.







Safety, size reduction, and savings are among the big benefits resulting from this polystyrene package for linestarters (below, left). Shipping these units was a headache, because they're heavy, fragile, and irregular in shape. The old carton (right), with layers of corrugated inserts, was costly. Packaging Engineer Russ Brown tried expanded polystyrene pads molded to exact shape of the linestarters. The new package costs less, eliminates a dust problem, and gives far more protection.



WILLING AND ABLE: BUT— ARE YOU READY ?

An Editorial Commentary

BY OSWALD STEWART
ASSOCIATE EDITOR, FACTORY

Oz Stewart started with FACTORY more than four years ago. His principal assignment: to travel the nation from top to bottom, from one side to the other, in search of the latest industrial building practices. Right now he's roving the country, giving this year's Top Ten (May, 1961) contenders the critical eye.

You are going to build a new plant or expand your present one within the next few years. The experts say you will. That is, if your company is among the vast number of firms that must enlarge and improve manufacturing operations simply to keep up with competition.

When the time comes, will you be ready? I mean, ready with all principal details worked out ahead and no major item overlooked or ill-conceived? Many new buildings I've seen contain obvious flaws that have no excuse for existing. In the rush to build, something was overlooked. The penalty: inefficient, money-wasting operations.

The penalty can be avoided with more planning ahead, more time to review omissions and improvements.

To prove my point that people are not ready by the time plans are frozen, or construction catches up with them, here are a few startling examples collected during five years of traveling for **FACTORY's Annual Top Plants Competition:**

• **There's the near-perfect East Coast plant that literally forgot its maintenance facilities.** Its "elaborate" facilities: a pipe-threading bench in a tiny corner of the integral boiler room; a few tools scattered throughout a utility core; spare parts stacked on air-conditioning ducts; no doorway in the core large enough to accommodate service machinery. What had happened? I suspect that the basic checklist omitted the maintenance point, and no one caught it.

• **A handsome plant in the South Central states was completely lined with shiny glazed tile.** "It will be easy to keep clean," I was told. But overhead was an untreated steel deck roof. The noise from the first of several new metalworking lines was enough to make your head ache. The plant manager was obviously proud of his new plant. But he did admit that he would soon have to apply acoustic treatment.

• **Fluorescent fixtures with no upward component are the present standard in a three-year-old heavy equipment plant.** What little light does bounce upward is virtually absorbed by a gray cement plank roof deck. To me, the effect is gloomy, though there is probably a safe minimum of light on the machine tools. Comment: With more planning, the plant's designers could have studied the new I.E.S. standards more thoroughly. They could have visited some really well-lighted plants. And they could have seen how important quality lighting is to alert manufacturers.

Plant design and construction boners like these cost money.

Is there a solution? I think so.

Perhaps no one can build a "perfect" plant. There are always compromises in costs and design that don't fully satisfy planners. But you should *seek* perfection by providing time to explore *all* the design factors. Then, if you want to accept less-than-desirable conditions, you're doing it with open eyes. You can't blame poor results on lack of time. How do you gain this vital lead time? You need nothing startling—just a few common-sense steps like these:

• **Start now to collect ideas for "that new plant."** No matter how fanciful, some one idea may be just the thing when the time comes.

• **Visit new plants in your own field and in other fields at every opportunity.** Jot down and file their good ideas.

• **Keep a file of ideas for building materials and equipment you can use in your new plant.** An organized file of catalogs and clippings will help crystalize decisions when time is short.

• **Plan to visit Clapp and Poliak's new "Industrial Building Exposition and Congress" at the New York Coliseum, Dec. 12 through 15.** There you'll find expert speakers, symposiums, and manufacturers' exhibits on almost all phases of plant design and construction. Included are such related topics as finance and plant location.

BETTER RECORDS MANAGEMENT

The loaded desk, once a symbol of the office area, is now a familiar scene throughout the factory. Production executives and administrators down the line have to split their time between plant floor and a desk-top avalanche. Many, inexperienced in the ways of the paperwork world, are finding it harder and harder to make both ends meet.

Paperwork is here to stay. The complex industrial enterprise of today would stop stone-still without it. The only recourse for those harassed by this problem, is to learn better records management.

On the next four pages are 150 practical tips and facts to lighten your paperwork load.

By CHARLES E. HUGHES
Company Records Manager, Douglas Aircraft Company, Inc.
Santa Monica, Calif.

..BETTER RECORDS MANAGEMENT

BEWARE THESE INDICATORS OF WEAK CONTROL

Steady purchase of filing equipment—If business is not expanding and filing equipment purchases continue, it's a good bet that there is insufficient records turnover throughout the department.

Shortage of storage space—A continual race between records volume and filing space indicates one of two things: (1) Filing space is inadequate. (2) There is not sufficient control of what goes into the files and how long it is kept.

Crash searches—If the need for important information usually ends up in a crash search, your filing methods need overhauling badly.

Delays—Where data are hard to find, slow in transit, and erratic in content, it is usually a case of everyone having a filing system of his own.

Steady purchase of duplicating equipment—Indicates that systems are being built on top of systems.

No retention periods—Retention periods must be established, thus permitting systematic disposal.

No vital records plan—Lack of a plan for disaster protection of key records can spell serious trouble where the future of the business is concerned.

PUT DATA IN WRITTEN FORM

. . . When excessive job instructions are required (this situation often signals the need for written job descriptions or work outlines).

. . . When information received orally is hazy, sketchy, or is likely to be prejudiced.

. . . When mental or visual control results in wasted motion or erratic performance.

. . . When there is reason to suspect dishonesty.

. . . When accuracy of the information desired is so critical that memory should not be relied upon.

. . . When labor-management negotiations and agreements are of any consequence.

. . . When business (internal or external) transactions are suspected of having legal overtones.

. . . When an excessive amount of a manager's time is required to search out information.

. . . When performance departs from the norm, such as excessive scrap, rework, etc. (a temporary reporting system may be required here).

CHECK THESE TIPS ON PAPERWORK PROCESSING

Paper costs—By substituting a good grade of newsprint for bond paper commonly used in the internal paperwork system, costs can be cut almost two-thirds.

Tracers—When typing correspondence where a tracer may be needed, make an extra "tracer" copy.

Duplicate letters—If more than 10 or 12 identical letters are to be sent to various sources and you want them to be personalized, don't type each one individually. Instead, offset-print the body.

Form instructions—When a number of people use a form, print instructions for use on the back of it. This will not only prevent misuse of the form, but will save untold references to policy instructions.

Mass slogan media—One sure way of putting plant slogans before everyone is to print them, in a convenient spot, on all internal memoranda forms.

Correspondence aid—Time can be saved by extracting re-usable paragraphs from correspondence and arranging them in a book under appropriate headings.

Reports identification—Every report should carry a cover sheet showing originator, approval source, nature of report, name of recipients, how often issued, and the number of reports in the series. This brings all facts out of hiding and affords authority an opportunity to challenge any part of it.

Reports questionnaire—Periodically, a questionnaire should be attached to each report, requesting information as to usability. Recipients not responding within specified time are automatically deleted from the distribution list.

Chart room—A modern trend in reporting is to abolish the written-type report wherever possible and establish a central chart room. Here, a composite picture of the entire factory operation may be viewed at leisure.

Correspondence retention periods—Provide retention block on all internal correspondence forms that require originator to insert a specific period through which his files will be kept available.

Management bulletins—Rather than have every department in the plant retain miscellaneous bulletins (other than policy), preprint a retention notice on the face of the bulletin to this effect: "Do Not File," "Destroy After 30 Days."

Help thy secretary—You can help the files reduction cause by penciling-in a retention target date on all incoming correspondence. The secretary can then set up her files accordingly and arrange for a periodical review. Otherwise, she has no idea what value you might place on a piece of paper.

Standard worksheets—Instead of letting everyone in the plant spend time drawing up his own worksheets, design a selection of general-purpose worksheets and place them in the stockroom. One company found that 15 forms would suffice for 200 that had been individually prepared by the departments.

Organization charts—Instead of fussing around with the large unwieldy organization chart, prepare it in sheets or sections on 14x11-in. paper and have it reproduced to the standard 11x8½ inches.

Stock issuance—If you have a central stockroom, limit every department to a two-week supply of stationery. This way, form changes won't catch offices with a big inventory of stock on hand.

Recover filing space—Hold a files inspection. Chances are good that you'll find, in some cases, as much as 20% of the available file-cabinet space being taken up with personal belongings such as shoes, purses, umbrellas, etc.

Records disposal—When disposing of "company" classified records (not military), instead of going to the expense of shredding or pulping, accumulate a truckload of material at a time. Then, under escort of a company employee, have the load taken to the local municipal dump and burned.

Snap-out forms—Non-carbon forms require seven distinct operations to complete the typing process. Sheets interleaved with one-time carbon require only three operations.

ELIMINATE THESE CAUSES FOR POOR SYSTEMS

Inexperienced personnel—The development of filing systems should not be left to persons who do not understand the purpose of records, or the way the company plans to use them.

Wrong equipment—The type of filing equipment used should be dictated by the function of the file. That is, reference rate, speed of reference, how the material is accumulated, etc.

Uncoordinated effort—No department should be allowed to go its own way with paperwork systems.

Nobody at the helm—One person or group should always be available to assist with filing problems.

CONSIDER USING THESE FILING AIDES

Sorters—Many types of sorting guides—bins and other devices—are available. These provide for various degrees of document pre-sorting prior to filing. They save time, help reduce out-of-sequence filing.

Portable file shelf—A small filing shelf that hooks onto the file-drawer handle permits a clerk to set her papers down within easy reach and to use both hands in the filing process.

Filing stool—The short stubby roll-away filing stool is not used enough. If the clerk can sit comfortably, bottom drawers of files will be used more.

Desk trays—Where paper traffic is heavy and varied, a good desk tray set-up can provide the first pre-sorting step.

Filing step or ladder—Clerks who are below average in height sometimes have difficulty servicing the top drawer of a five-drawer file cabinet. A portable step about a foot high will help.

RETAIN THESE ESSENTIAL RECORDS

- Purchasing records—reflect buying policies.
- Price records—show changing cost trends.
- Inventory records—show stock policies.
- Accountability records—tell you where things are.
- Plant layout charts—show locations, arrangements.
- Plant drawings—give visual support to new ideas.
- Deeds and mortgages—should be in separate safe place.
- Maintenance records—allow purchase projections.
- Contracts—give legal support; guard jealously.
- Factory materials flow charts and graphs.
- Planning records—reflect course of operations.

Turn the page

KNOW THESE FACTS ABOUT PAPERWORK

About 85% of paperwork cost is preparation and processing. Of the remaining 15%, 10% is consumed in maintenance of files.

The experts figure 60 to 70 cents of every dollar spent in retaining records is wasted because of indiscriminate retention practices.

Secretaries and clerks are either directly or indirectly responsible for at least 25% of all new forms and paperwork procedures fed into the system.

On an average, 85% of the paper filed is not referred to after one year.

At least 95% of all references are made to records less than 5 years old.

As a general rule, manufacturing organizations should not average over 2 cubic feet of records for each employee. Straight shop operations should not average over half a cubic foot per employee.

Records should be measured in cubic feet rather than by drawer or container. A letter-size file drawer equals 1.5 cubic feet. Legal-size is 2 cubic feet.

The ideal records situation for a company is the three-way split: one-third of total records retained in active files, one-third transferred to inactive storage, one-third destroyed or sold as waste paper.

Companies with more than 4000 cubic feet of records can save money with a low-cost inactive storage area.

One person in the archives can handle about 7000 references per year, plus interfiling.

When reference to active files falls below 10 per year per cubic foot, the records should be transferred to inactive storage.

In a well-organized inactive storage center, records can be retained from 80 cents to $1 per cubic foot annually.

Well over 90% of requests for reference to filed documents, whether in central files or storage center, can be filled by phone.

Average inquiry to stored records should not take more than three to five minutes.

A well-organized storage center can store 3½ cubic feet of records for every square foot of space.

Ordinary uninsulated steel file cabinets will afford only about five minutes of protection in the average office fire.

Records can be retained in their original state for 12 to 15 years for the price of microfilming.

For every dollar spent in the printing and stocking of forms, 20 cents is wasted through poorly planned revision and obsolescence.

Many estimate that at least one-third of a manager's reading time is wasted because material sent him is either repetitious, late, or irrelevant.

...BETTER RECORDS MANAGEMENT

- Work-in-process orders—prevent lengthy searches.
- Quality control records—show policies, methods.
- Industrial engineering schedules, standards.
- Tooling, drawings, design standards, etc.
- Materials and process records, research reports.
- Industrial relations records.
- Product design engineering records.
- Factory organization and policy statements.
- Accounting and sales organization and policies.
- Business entity charters, franchises, etc.

KNOW THIS ABOUT OPEN-SHELF FILING

Open-shelf filing will save up to 60% in floor space. With it, a ratio of 3000 inches of filing space to 30 square feet can be obtained.

A 50% reduction in reference time can be realized over many systems using filing cabinets.

Depending upon grade of file cabinets used, open-shelf systems cost 30 to 70% less to install.

Open-shelf files allow easier access for shifting records to maintain continuity of filing sequence.

They're ideal for large-volume active filing.

They're especially adaptable to records such as blueprints, tool planning orders, personnel history folders, production control work orders, purchase orders, and the like.

NOTE THESE ADVANTAGES OF CENTRALIZED FILING

- Greater control of records. Records of a division or plant are gathered at a central location.
- Improved records coordination. Merging of all records having a common purpose will permit greater utilization of information.
- Specialization in filing and indexing procedures.
- Elimination of duplicate records.
- Better distribution of peak work loads.
- Easier standardization of systems.
- Centralization of authority.
- Economies in equipment and space.
- More easily installed and more effective training programs.
- Perpetual inventory of records.
- More effective control of records and policies.
- Greater protection against disaster.

CONSIDER THESE BEFORE RETAINING RECORDS

Statutory limitations—Certain federal statutes, such as the Social Security Act, Wage Hour law, and various state statutes, either require or make it desirable that certain records be kept for specified periods of time.

Business reference value—Records that enable management to secure factual information are of direct value in the conduct of business.

Duplication element—Where records are prepared in multiple copies or reproduced, it is necessary to decide which is the "record" copy. Warning: The original is not always the best copy to keep, especially if important information is added to one of the copies.

Value as supporting record—A record may be transcribed or summarized in another record. If summary records are not entirely self-sufficient, selected detailed records should always be retained in their support.

Research reference value—Records generated during technical and scientific developments may have great research reference value for similar future projects.

Legal value—In various forms of litigation it may be necessary that certain records be introduced as evidence. Your legal counsel will be able to categorize many of the record types.

Historical reference value—Certain facts and events relating to the growth of progress of a company should always be kept.

Temporary value—A great volume of internal records are of passing interest and have no retention value, short of a few days or months. Such things as transmittal letters, acknowledgments, confirmations, and general distribution matter should never be permanently filed.

Determination of what a record should do—When this is determined, half the battle of setting an appropriate retention period is already won.

Is it vital?—Vital records are a select group of documents that not only constitute the legal entity of the company but carry information of a nature that would substantiate claims and permit reconstruction of certain vital operations in the event of disaster. They represent only about 2% of the total records volume.

DO THESE THINGS TO PROTECT VITAL RECORDS

Determine vulnerability to disaster—In the case of natural disasters, such as fire, flood, explosion, etc., damage would probably be localized. Protection might be facilitated by duplicate copies existing elsewhere in the company. In the case of man-made disasters, such as nuclear explosion, greater protection or dispersion is required.

Determine after-catastrophe needs—Barring complete annihilation, a business would most likely be confronted with these tasks the morning after a disaster and would need supporting data to:

- Substantiate the business entity.
- Resist all unjust claims.
- Collect insurance indemnity.
- Collect all accounts receivable.
- Determine all accounts payable.
- Resume key operations.

Classify records—Pick out the minimum number of records that will accomplish the above tasks.

Protect them—Isolate the records chosen from other records and provide them with sufficient protection to insure their being on hand when needed.

Maintain them—Once a vital records plan has been established, feed in current data and remove the old.

SET MINIMUM STANDARDS FOR STORAGE AREA

Location—If the area selected is located on the premises, it should be as close to the operating offices as possible. If it is purposely located off the premises (for disaster reasons), it should not be more than 25 miles away.

Rent—If located on the premises, the center should be in a non-productive area; if located off the premises, it should be in a low-rent district.

Size—The area should be able to house all the present inactive records with enough space remaining for a 25% expansion.

Security—It should offer safe storage from dirt, dust, fire, flooding, and unauthorized entry.

Layout—If possible, the floor-to-ceiling height should be sufficient to permit the installation of 10-ft.-3-in.-high shelving. It should be as free of obstructions as possible.

Floor load—Floor-load capacity should be at least 150 pounds per square foot.

Ventilation—Ventilation should be adequate to prevent heat build-up and excessive drying-out of records. A humidity range of 60 to 70% is desirable.

Lighting—Layout of lighting should conform to the aisle-shelf arrangement. Maintain a strength of at least 25 foot-candles.

Access—A personnel entrance and a shipping-receiving type of door is necessary, along with a fire exit.

Fire protection—Sprinkler systems are questionable since the accidental discharge of a head can cause as much, if not more, damage to records than a small fire. Maintaining rigid fire prevention rules are perhaps the best bet.

Stack arrangement—Better use of space is possible if stacks run lengthwise in the storage area.

Aisles—The aisles between stacks should average 30 to 36 inches in width, with at least one service aisle 5 to 6 feet wide running lengthwise down the center of the area.

Reference—A reference room should be provided in or adjacent to the office space for those who must come to the storage area to refer to records.

Equipment—The lowest-cost means of storing records is through use of standard steel shelving and cardboard containers. The inside measurements of the container should measure 10x12x15 inches.

KNOW THESE FACTS ABOUT MICROFILM

Microfilm can reduce the space required for records by 98%.

The average 100-ft. roll of microfilm will contain about 3000 run-of-the-mill office records, or the approximate capacity of one letter-file drawer.

A 100-ft. roll of 35mm film will contain the images of about 1000 engineering drawings.

A 35mm microfilm should be used for such things as drawings, bound books, newspapers, maps, x-rays, or any other larger material.

A 16mm microfilm is used for all other types of records—those 8½x14 inches or smaller.

Reduction ratios for 16mm film on materials 5x3 inches up to 9x6 inches, should be within the range 24 to 40:1. For 8½x11-in. material, the acceptable range is 17 to 24:1.

On an average, automatic microfilm feeding devices will feed at the rate of 2000 to 3000 documents per hour, depending upon the size and condition of the paper. Hand feeding will average 300 to 450 documents per hour.

The average cost for a 100-ft. roll of microfilm (just film, not labor) is about $6.50. This usually includes development cost after exposure.

The cost of microfilm where an outside agency does all the work averages out at about one cent per image. Where the work is done by your own company personnel, the best price possible is about 1.5 to two cents an image.

Do not, in any case, dispose of the original records until the film has been developed and thoroughly inspected for image quality.

Microfilm is most generally acceptable to the courts as primary evidence provided that: (1) the records have been destroyed, (2) the filming was done in the regular course of business, and (3) the authenticity of the film contents is properly and clearly certified at the beginning and ending of each roll or strip of film.

The life of a microfilm is practically unlimited if properly protected. Film should be inspected once a year for mold or excessive brittleness.

Roll microfilm does not lend itself to interfilming. It should be complete and in sequence before set-up and filming.

Files with a specific sequence, such as numerical or alphabetical, are better suited for microfilm than general files because the desired image can be located more quickly.

The ability to extract information from microfilm is improving. But remember that reference to microfilm (especially in rolls) is still not nearly as fast or easy as with paper. A file should be virtually inactive before being reduced to film.

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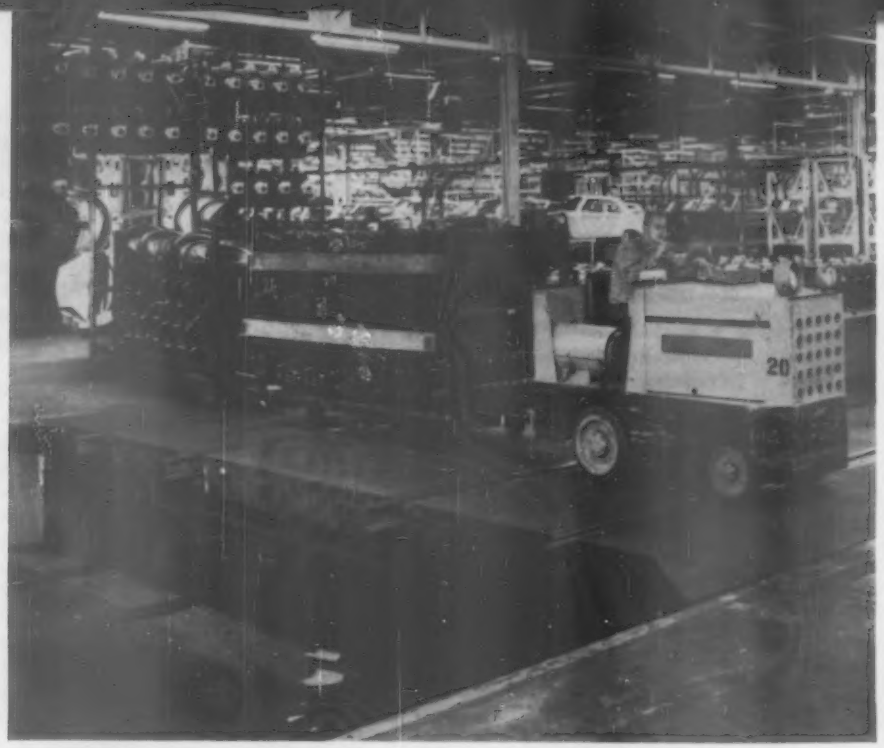
PARTS ARE ROUTED...



THEN DELIVERED TO STORAGE AT POINT OF USE BY TOW TRAINS ON

TRACKLESS TRAINS keep material

"Everything else be damned. We have to keep the material flow right on schedule. A bottleneck anywhere along the line will throw a monkey-wrench into the entire operation." That's how emphatically one engineer expressed management's feeling at Ford Motor Company's Lorain, Ohio, assembly plant. "Material handling is the single most important operation in our plant."

It's a plant actually built for material handling —right from the drawing board stage. All other considerations were secondary. The layout of the building was designed to permit Ford to coordinate the movement of parts—from the time they're received at the railroad or truck docks to the actual point of use. The company calls this system Integrated Material Handling.

A 400-man material handling team keeps the system operational. It pilots the trackless trains, operates a battery of fork trucks, and unloads rail shipments along a ⅓-mile-long railroad spur that cuts through the heart of the 3200-ft. building. Some 1,800,000 pounds of parts are delivered to the building daily.

The key to the system, however, is an in-plant tow-train railroad, run on a definite schedule. These trains travel back and forth along 7½ miles of bays, each pulling a string of three to six trailers. Average total load: 8000 pounds.

The propane-powered tow trains are assigned to 17 separate routes, transporting incoming materials from the receiving docks to their destinations throughout the plant.

LAYOUT FOR MATERIAL HANDLING

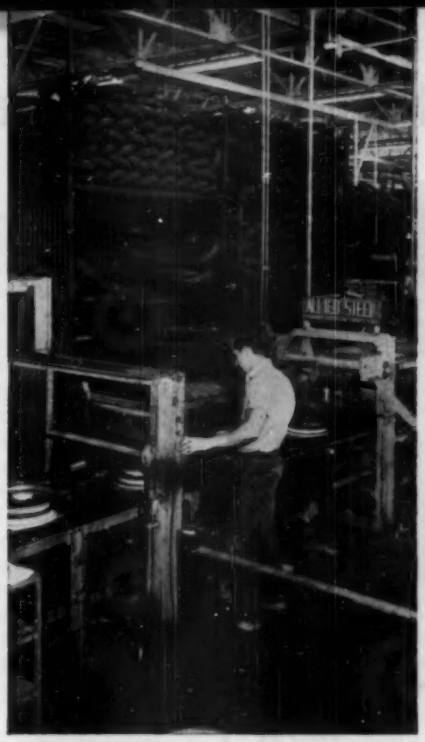
• **Double railroad spur:** The two-track spur actually divides the plant in half. There's room for 54 cars—27 on each track—which means a loading dock a third of a mile long."

Departments are built around the spur to facilitate delivery of parts. The body assembly and paint shops are to the east while the car and truck assembly areas are to the west.

The photo directly above shows one of three bridges across the tracks. They were built strong and wide enough to permit the tow trains to cross without difficulty. The center bridge is stationary. The two end bridges depress to allow railroad car movement, then rise to permit in-plant traffic to pass.

• **Truck docks:** They're located next to the railroad spurs to allow easy servicing by tow trains. They can accommodate 18 trucks at once.

ASSIGNED SCHEDULES...



CARS BECOME BINS...

HELP STANDS BY.

running on a crack timetable

• **Aisle network:** All aisles used for materials movement are wide enough to accommodate the tow trains. Main aisles are 15 feet wide, while secondary thoroughfares measure 12 feet. All stock storage areas are serviced by main aisles. This permits maximum utilization of power equipment for movement and tiering.

There's no chance of getting lost in the maze of thoroughfares. All aisles are marked off in grid coordinates. Those running perpendicular to the railroad dock are lettered, and those running parallel are identified by numbers. If an aisle has a secondary number, it indicates there is more than one aisle in that bay.

Here's how the integrated handling system works:

Since 85% of incoming parts are delivered by railroad and 15% by truck, the railroad spur is the hub of activity. Rail cars are coded by number to indicate contents, and are spotted as close as possible to the departments they supply. For example, cars carrying metal goods are always put in one of the first seven places on the south end of the easterly track. A sheet listing the positions of all cars is distributed to the transportation foreman and all tow-train operators at the beginning of each shift. The same general procedure is followed at the truck docks.

There are 27 tow trucks in operation, with 17 of them following a scheduled route. Two others are usually assigned to maintenance functions—one to the paint department, one to general stores. The rest are for general use. The entire tow-truck system, however, is under the control of a transportation foreman.

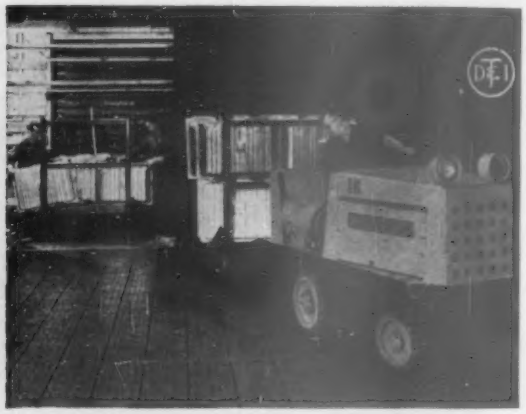
Three of the trackless trains on general assignment have two-way radios. If an emergency arises, they can be called in from anywhere in the plant.

If several tugs go out of commission, it's the foreman's responsibility to determine which departments need the tow equipment most. Number one order: Never allow a line to shut down because of transportation difficulties in delivering parts.

When material arrives, the receiver-checker makes out a plant routing tag for each load (photo at extreme left). The tag includes the tug route and the aisle and bay location of its destination. This is done by means of a plant locater list. The checker notes the part number of the load, then checks the list to find out just where the parts belong. The list can be especially helpful in mixed cars. These may contain anywhere from 10 to 250 different parts for the assembly of Ford's newest compact car.

Then the checker and assistant push an empty

...Trackless trains slash cost—but only if they're used right



TRAILERS ARE MADE UP AT RAILROAD DOCK.

TRACKLESS TRAINS VS. FORK TRUCKS

All incoming parts with a destination further than 150 yards from the receiving docks are hauled by this in-plant railroad. For shorter distances fork trucks are used.

The 150 yards is not an arbitrary figure. Ford engineers figure that for shorter distances it's cheaper to use the lift trucks. Above that figure, tow trains are far more economical.

Operating labor, equipment operation, and replacement costs are figured in this calculation. The chart below is based on a 1-ton load for both a standard fork truck and a tow train carrying four trailer cars.

TRANSPORTATION COSTS IN DOLLARS

Distance in feet	Fork truck	Tow train
50	.23	.30
100	.26	.31
140	.32	.32
200	.35	.33
300	.42	.35
400	.54	.37
600	.69	.39
800	.83	.42
1000	.99	.46

dolly car into the train car, and manually load the material into the container. Once filled, the container loads are rolled out of the rail car and placed alongside the dock. They're then picked up by the tow operator when making up an in-plant train load. Speed is emphasized at this point to prevent pile-up.

Materials can be stacked in any one of 10 different kinds of containers for tow-train transportation. In the center photo (previous page), three are illustrated. It's the tow-train operator's job to know in which type of basket each part belongs. This is important because most of the trailers have a secondary purpose. They become tiered storage bins at the point of use. This, in effect, creates mobile storage. When the containers are emptied, the tow train picks them up, brings them back to the dock, and they're again in service immediately. There are about 15,000 storage-trailer bins in use, 5000 of which are in motion, while the other two-thirds are serving as storage racks.

TRACKLESS TRAIN OPERATION

The 17 tow-truck routes were devised so the entire assembly plant, including the outside yard areas, can be serviced. Each tow operator works on his own, within the bounds of these general instructions:

- Stay within his assigned route at all times.
- Transport all incoming materials assigned to his route from the unloading dock to the correct drop-off locations.
- Make each trip a round trip. The system was devised so ideally the driver will go out with a full load and pick up an empty bin for each full one he deposits. The efficiency of the route can be gauged by the number of returned bins.
- Always haul a payload of at least three trailers.

WHY TOW TRAINS?

The tow-train system allows flexibility in time of emergency. If parts are in short supply in any department, the "line feeder" can call the dispatcher who, in turn, will radio the transportation foreman. A call to one of the two-way radio tow trains will bring help immediately.

The alternative to the tow train would be a series of monorail conveyors leading from the docks to the plant. Ford officials, however, point out the following drawbacks:

- Higher initial installation costs.
- Too little flexibility for model or layout changes.
- No provisions for emergencies.

"Material handling is the last great area for heavy cost-cutting in our industry," claims J. Ashley Brewer, process engineer, who installed the system in the Lorain plant. "Most everything else is automatic. We feel that growing automation will increase the importance of getting material where it belongs in a hurry. That's what we're striving to do."

MORE!

ELECTROSTATIC TOUCH-UP booth can put an end to paint waste at your plant. And speed up your production line. It supplements the electrostatic spray booth. No more manual touch-up. ..... p. 139

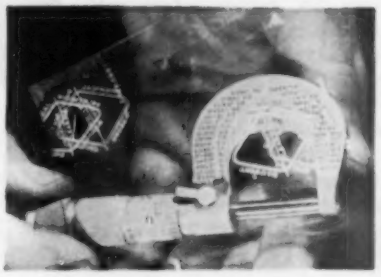
RUNS ITSELF This system for scheduling plant maintenance takes a minimum of paperwork, tells the who, what, when, and where of every job that needs to be done at Besly-Welles Corporation. ..... p. 176

WIRELESS MIKE and remote tape recorder are used in walking inventory check. ..... p. 102

RINGS, SLINGS, AND THINGS are described in these 53 new catalogs. ..... p. 184

WANT TO KNOW how to use precast concrete panels for sheathing buildings? ..... p. 200

RUSTPROOF PACKAGING has a volatile vapor barrier, can be used in automatic packaging. ..... p. 204



ARMOR-PLATING under tire's rubber coating virtually eliminates flats. ..... p. 132

WIVES can't afford accidents. The successful safety drive begins at home. ..... p. 154

$&%#⚙%*$&! Profanity in the shop. Is it routine or insubordinate? ..... p. 162

LONG OVERDUE is this massive reference book of science and technology. ..... p. 196

FACTORY EQUIPMENT NEWS

For more about these items, circle numbers on Reader Service Card next to back cover.

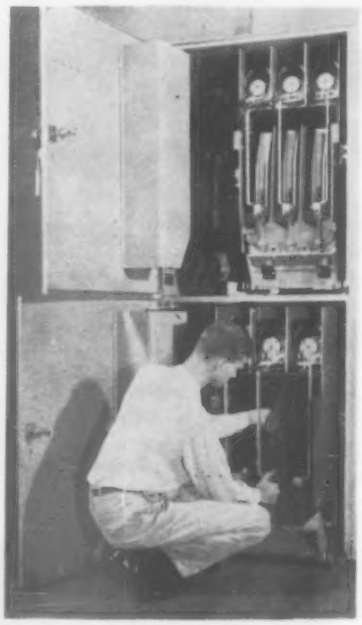
Stack 'em two-high, save space

"Smaller on the outside" is the big news about this high-voltage motor control. For the first time you can tier two of these fused drawout controls, saving the floor space of one. Space-Maker is 45 in. high or one-half the size of standard models with the same rating and capacity.

The roll-out unit includes all major high-voltage parts and disconnect fingers. This simplifies maintenance. Lift-out arc chutes and hinged blowout pole pieces ease contact inspection. Overload relays are visible through glass window. Second tier uses wheeled dolly to hold rollout unit for servicing.

Now let's get down to economics. Control can be installed without floor sill, so there's no need for expensive grouting. Parts are interchangeable in various hp. ratings. This cuts down spare parts inventory. And for long, trouble-free life, contactor has double-break contacts—no flexible leads.

Standard models come with thermal overload and instantaneous under-voltage relays. Other normal optional features can be supplied. In ratings to 1750 hp. at 2.3 kv., or 3000 hp. at 5 kv. Current-limiting fuses interrupt 150 or 250 mva. at 2.3 or 5 kv., respectively. Models are available for full or reduced voltage and starting, reversing. *Allis-Chalmers Co.* (Circle 88).

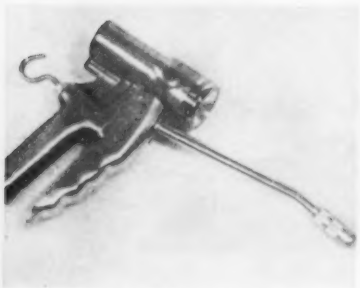


91—Hand Dryer is compact, efficient unit that blows warm air over a mile-a-minute to completely dry hands in less than 30 sec. Two models: one flush to wall, other projects 4 in. Pushbutton activated, automatic shut-off. Uses less than 400 w. *Washex Corp.*

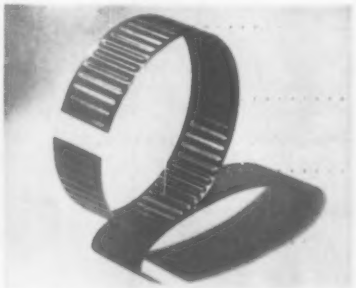
92—Liquid Chillers, for air conditioning or cooling, come in package requiring few field water-piping or electrical connections. Eleven models, with capacities to 67.1 tons. Slim line. No shaft seal, thus minimum leakage. Little maintenance. *American-Standard.*

93—Prefab Clean Room is easily assembled from modular, insulated panels with doors, windows, etc. Provides an uncontaminated atmosphere for testing, assembly, repair of high-precision products. Design allows expanding or modifying to suit needs. *General Acoustics Corp.*

94—Hand Tachometer, in light metal case, has thumb switch that changes scale to permit fine readings. Reduces error. Three models measure from 200 to 10,000 rpm., 100 to 5000 rpm., 20 to 1000 rpm. Special disk measures surface speeds directly. *Metron Instrument Co.*



89—Grease Gun, with built-in flashlight, is ideal to lubricate hard-to-see unlighted equipment in both night and day lube operations. High-pressure gun (weighing under 2 lb.) lights with slight pressure on trigger; increased pressure fires the grease. *LubriLite Corp.*



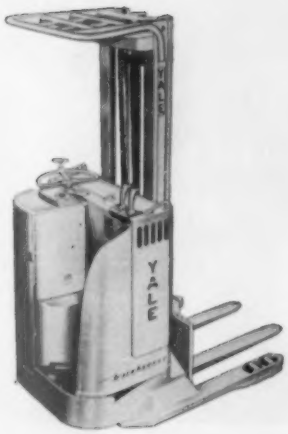
90—Tolerance Ring fastens bearing in housing or wheel on shaft (without key or keyway) for limited torque transfer. Allows wider-bore tolerances. Low cost, easy assembly. Corrugated open-steel ring comes in 3/16- to 12-in. diameters. *Roller Bearing Co. of America.*

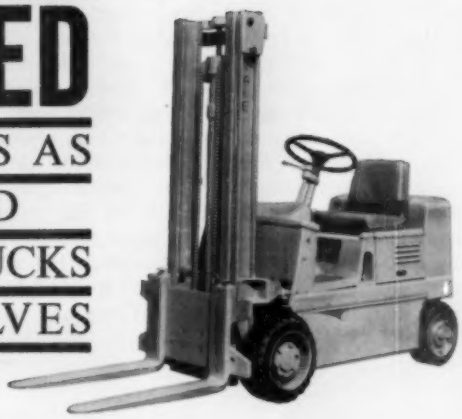
95—Flexible Connectors, for pumps and pipelines, absorb vibration, misalignment, thermal expansion. Stainless or galvanized steel, Monel or bronze, threaded or flanged ends; 3/4- to 16-in. pipe sizes. Handle pressures to 1500 psig., heat to 1200 F. *Allied Metal Hose Co.*

Turn the page

YALE TRUCKS LEASED

ON PLANS AS VARIED AS THE TRUCKS THEMSELVES





One of the following Four Flexible Finance Plans will put any Yale Truck to work earning profits for you immediately. The advantages of each plan, outlined here, will help you decide which plan best meets your requirements. Look them over.

1 **Time Payment Plan.** Under this plan you make a small down payment and the truck is delivered. Thereafter you make monthly payments adjusted, within reasonable limits, to your requirements.

2 **Leasing Plan.** Under this plan you can lease a Yale gas or electric truck for a period up t 5 years with renewal options available for additional periods. Rates of payments are flexible to meet your needs.

3 **Leasing Plan with Purchase Option.** Under this plan you get the advantages of a straight leasing plan on pre-arranged monthly payments. But you can arrange for title of ownership to the truck by paying a small additional sum at the end of the lease.

4 **Leasing Plan with Maintenance.** Under this plan you can lease a Yale truck on terms outlined in Plan 2 or 3. But for an additional sum you can obtain full maintenance including all repairs, replacement of parts, and labor costs.

These Four Flexible Finance Plans represent the basic financial terms under which Yale trucks are leased. However, if you are confronted with unusual circumstances, we will make every effort to arrange a special plan "tailored" to your specific needs. But whichever Yale plan you decide upon, remember that you will have the best in lift truck equipment powered by gas, electricity, Diesel or LP gas. For more information write to your nearest Yale dealer or to us direct.
Yale Materials Handling Division, a Division of the Yale & Towne Manufacturing Company, Dept. X-010, Philadelphia 15, Pa.

YALE®
INDUSTRIAL LIFT TRUCKS
TRACTOR SHOVELS · HOISTS
YALE & TOWNE

For more facts Circle 424 on Reader Service Card

For more about these items, circle numbers on Reader Service Card next to back cover.

Infra-red heat source at 3500 F. in pea- to porpoise-size units

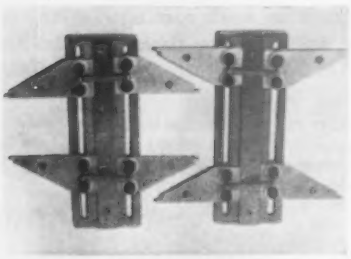
Here's an infra-red heating unit that doesn't bog down when operated at over 3500 F. for prolonged periods. If you've been looking for such an intense heat-treating source, try this one for size.

This unit generates concentrated heat by using a ceramic-quartz infra-red reflector. Where fast response and accurate temperature control is required, it fills the bill. Despite the high heat, it is said to offer long life and control of temperature ranges to within ±2.5 F. Operating costs can be lowered with curing time up to ten times faster.

Hand-carry units are useful for heat-treating, pre-heating, and stress relieving. Other applications include space heating, de-gassing metals within glass vacuum, metal pre-heating for inert welding. Model shown was originally designed to stress-relieve welded seams on penstock pipes.

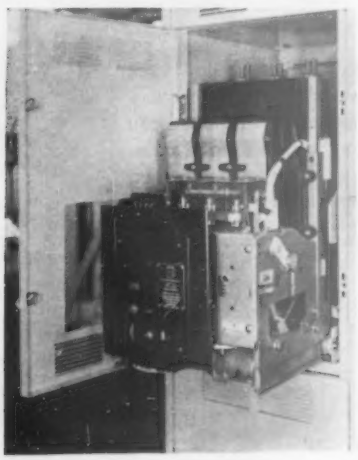
Heater is available in any dimension from 1x1-in. heat source to a 10x10-ft. surface. Designed for portable and production-line use. Also custom-made for any requirement. *Plastic Weld Co.* (Circle 96).

Adjustable go/not-go "Jack of all gauges"



Save money on special gauging with this adjustable go/not-go gauge. Each of two pairs of arms can be adjusted independently to preset minimum and maximum tolerances in 5-in. range. Ideal for checking ID or OD where grooves, thread relief, etc. are inspected in quantity. Accurate to millionth of an inch. *Speed Tool Co.* (Circle 97).

Improved fuse-breaker package



This compact drawout package combines the main advantages of fuses and breakers. Housed in a single low-voltage switchgear compartment, it provides protection against faults to 200,000 amp.

A trigger-fuse device (at right in photo) eliminates single-phasing. If any fuses blow, three-pole breaker opens. When restoring service, operator can tell whether fuse has blown or breaker has been tripped by overcurrent.

Comes in two frame sizes, continuous current ratings from 30 to 600 amp. or 150 to 1600 amp., to 600-v. a-c., 250-v. d-c. *I-T-E Circuit Breaker Co.* (Circle 98).

99—Turret-Head Projection Welder offers four different weld stations. Four pushbuttons control individual dies and correct weld force sequence. Foot switch brings head down first, giving operator time to check position of part before welding. *Federal Machine & Welder Co.*

100—Fluorescent Light Fixture is gasketed to keep out dirt, dust, and foreign matter. One-piece plastic enclosure covers lamp—no breakage, can't loosen and fall. Can be hosed down. Smooth top mounts flush to ceiling. Lamps are easily changed. *The Miller Co.*

101—Mobile Paper Shredder, about size of water cooler, destroys 88 lb. of paper by reducing it to $\frac{3}{32}$-in. strips. Handles up to 8 sheets at once. No damage from paper clips, fasteners. Cabinet, on casters, has removable bin where shreds fall. *Michael Lith Sales Corp.*

102—Stepless Speed Control, for d-c motors to 5 hp., assures constant speed for machine tools, etc., regardless of load. Uses silicon-controlled rectifiers for compactness and long life. No tubes or moving parts. Low voltage drop. Simple to install. *ACF Industries, Inc.*

Turn the page

He's mopping up the mess for the last time

At a leading aircraft research center, high-frequency vibration caused severe oil leakage from hydraulic lines servicing a huge wind tunnel. Many man-hours each month were wasted cleaning up the basement floor underneath, even though drip pans were used extensively.

Now, after a change to a Suntac oil, the vibration-caused leakage has been reduced to a point where "mop-up" is not needed. Hydraulic-fluid consumption has been cut by 4000 gallons a year. That's economy! That's Sun quality—the best economy of all.

If your plant is troubled with a leaky system, a Suntac antileak hydraulic oil can save you money, too. Ask your Sun representative to show you the Suntac desk-top demonstration, or write direct to SUN OIL COMPANY, *Philadelphia 3, Pa., Dept. F-12 In Canada: Sun Oil Company Limited, Toronto and Montreal.*

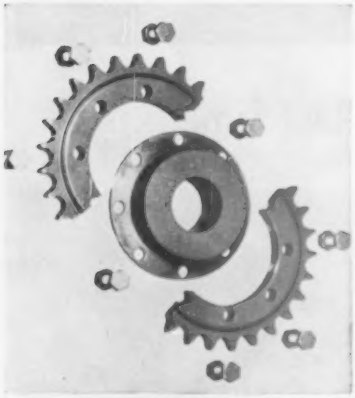
SUNOCO

MAKERS OF FAMOUS CUSTOM-BLENDED BLUE SUNOCO GASOLINES

For more about these items, circle numbers on Reader Service Card next to back cover.

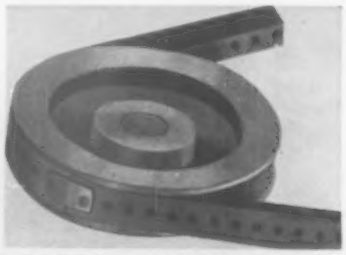
103—Welding Torch, for TIG arc welding, has flexible body for reaching into inaccessible interiors. Can be hand adjusted to any angle. One torch replaces inventory of fixed angles or sizes. Rated 300-amp. intermittent, 180-amp. continuous duty. *Falstrom Co.*

104—Pyrometer Controller has a solid state control mounted internally. Features galvanometer sensing element; high resistance input circuit. Shock resistant. Has 10-mv. span with ±0.5% accuracy against scale. For use with high-heat processes. *Daystrom, Inc.*



105—Three-piece Sprocket is assembled by bolting toothed twin rings around one-piece hub. This assembly permits replacing faulty sprocket without removing it from shaft. Simply revolve shaft and unbolt damaged section. Cuts downtime. *Daw-Sprok Sales Corp.*

106—Portable Power Saw cuts flush, up or down, left or right, without additional attachments. Operates in any cutting position—blades mount in six different positions. Two speeds —3000 spm. for wood, compositions; 2200 for metals, plastics, etc. *The Stanley Works.*



107—Perforated V-Belting can be joined with special steel fasteners and ordinary screwdriver—no special tools, jigs, knives. Available by the foot, belting can be made to suit all standard sheaves. No metal-to-metal contact, thus no vibration. *Rockwood Pulley Mfg. Co.*

108—Remote-Tape System records one hour's dictation with pocket-size wireless mike on voice-actuated remote tape recording/transcribing unit. Half-mile range. Special circuit cuts noise. Operates in citizens' band—no license needed. *American Geloso Electronics, Inc.*

109—Electric Truckster is fast, low-cost way to get one man around large area, or to make frequent trips in small area. Operates up to 40 miles before need to plug into 110-v. outlet for recharging. Goes through 25-in. passageway, turns in 70 in. *Cushman Motors.*

110—Sequence Relay is low-cost way to alternate operation of two pumps, compressors, etc. Cam rotates half step when coil is energized; completes it when it's de-energized. Contacts can operate on de-energizing stroke. Relay life: 10-million operations. *Struthers-Dunn, Inc.*

111—Quality Control Slide Rule gives direct reading (without intermediate computation) of upper and lower limits on number of rejects to be expected from given sample. Sizes from 2 to 1000, upper limits from 2 to 200, lower from 0 to 50. *American Hydromath Corp.*

Turn the page

Bigger... more rewarding than ever

the 1961 National PLANT MAINTENANCE & ENGINEERING SHOW and CONFERENCE

PM&E

INTERNATIONAL AMPHITHEATRE, CHICAGO—JANUARY 23-26, 1961

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You could spend months "at home" in talking to suppliers, and never see or know about more than a fraction of the products and services on exhibit at the 1961 Plant Maintenance & Engineering Show. Over 20,000 plant executives and engineers will be on hand to profit from this twelfth annual "show-of-shows." If your responsibilities bear on efficient plant maintenance and engineering, *your company needs you in Chicago in January.* And make your trip *doubly rewarding* this year by attending Conference sessions as well as Show exhibits.

Full information on any subject pertaining to the Plant Maintenance & Engineering Show & Conference is immediately available from Clapp & Poliak, Inc. at the address below.

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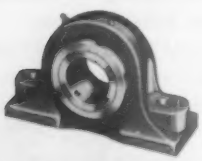
THE DRY FLUID DRIVE
New soft starts—overload protection

TAPER-LOCK
CHAIN COUPLINGS
No reboring—no waiting!



SC, SCM BALL BEARING
PILLOW BLOCKS
Quality, for normal and medium duty!

•

Write for Bulletins!

- ✓ Flexidyne Drives & Couplings.
- ✓ Chain Couplings and Sprockets.
- ✓ Bearings—Ball and Roller.

DODGE MANUFACTURING CORPORATION
400 Union Street • Mishawaka, Indiana

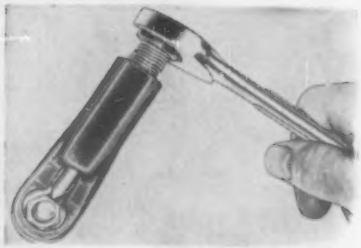
DODGE
of Mishawaka, Ind.

For more about these items, circle numbers on Reader Service Card next to back cover.

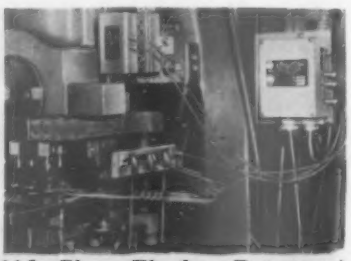
112—Load Cell System gives direct reading of force in pounds at distances over 1000 ft. from cell. It's ideal with hard-to-reach cranes, catapults and the like. Uses semiconductors—no tubes, amplifiers, etc. Capacities from 0-150 to 0-200,000 lb. *W. C. Dillon & Co.*

113—Rechargeable Battery, for all "D" 2-cell flashlights, has removable cap to permit recharging in a-c 110-v. outlet. Said to withstand 250 recharging cycles. Recharges to capacity in 14 hr. In nickel cadmium, hermetically sealed. *Gould-National Batteries, Inc.*

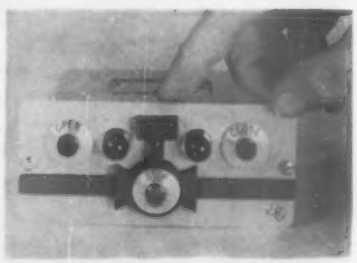
114—Variable Torque Control turns off power when motor or drive is overloaded or jammed; restores it when relieved. Can be adjusted manually to release and sound alarm at torque settings from 10 to 150 lb.-ft. Fits 1-, 2-, 3-groove pulleys. *Roberts Aircraft Engine Co.*



115—Nut Splitter removes rusty or frozen nuts without damage to threads or bolts. Hex shaft with steel bolt and cutter fits over nut. Threaded bolt is turned until nut is split. Gets into hard-to-reach spots. Sizes: ¾ or 1 3/16 in. *Borroughs Tool & Equipment Corp.*

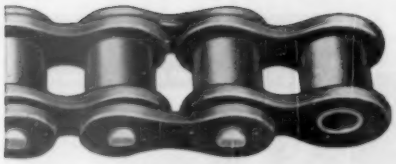


116—Piece Ejection Detector is electrical control that eliminates die breakage. For punch presses (dog-type or air clutch), Cycle-Chek also adapts to automated operations and progressive sequences. Can't be shorted by metal particles. *Rehrig Safety Controls.*

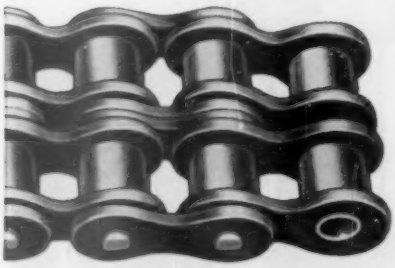


117—Remote Control, for power-operated devices, provides "open-stop-close" or "on-off" control and status indication. Uses only two wires between remote point and central control. Can be used with valves, motors, blowers, pumps, etc. *Texas Instruments Inc.*

Turn the page



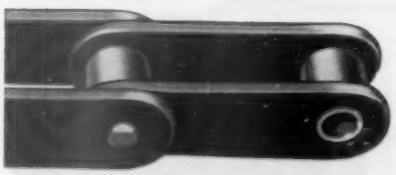
SINGLE STRAND



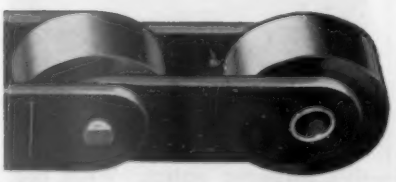
DOUBLE STRAND

SINGLE STRAND, HEAVY SERIES

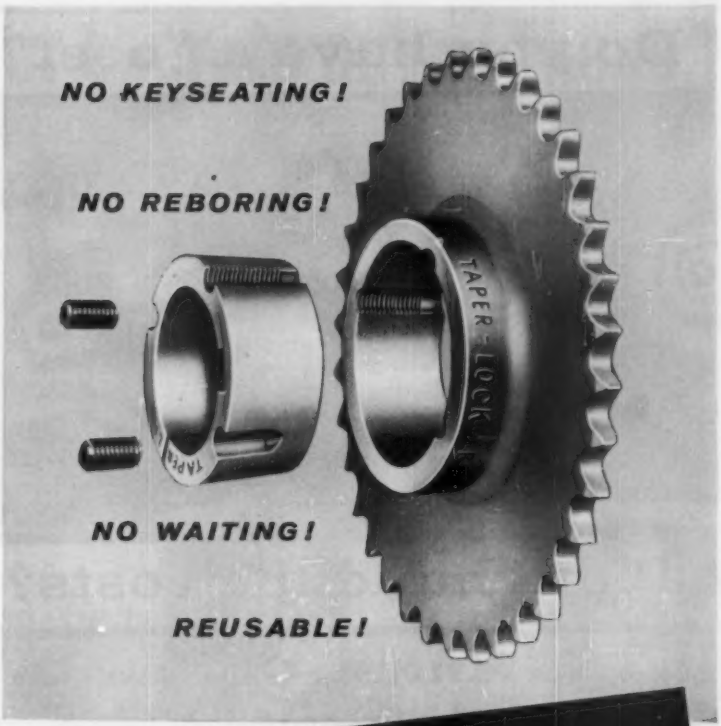
DOUBLE PITCH TRANSMISSION



DOUBLE PITCH CONVEYOR



DOUBLE PITCH CONVEYOR, LARGE ROLLERS



TAPER-LOCK SPROCKETS DODGE ROLLER CHAIN

DODGE Quality Roller Chain, teamed with Dodge Taper-Lock Sprockets, results in chain drives and chain conveyors that have the precision, efficiency and stamina necessary for the real economy of *long life*.

Moreover, Taper-Lock's reusable bushing makes a difference in overall cost. The ease of Taper-Lock mounting, the elimination of reboring, keyseating, and wasted time, add to the saving. Precision machining and true articulation lengthen the life of *both* sprocket and chain.

The Dodge line of chain, including standard attachments, is extensive. It meets a high percentage of all chain requirements.

In the Double Pitch series (both Transmission and Conveyor) the sizes which require special spacing for perfect tooth action are offered from stock in special double pitch design — to double the life of the chain and the sprocket!

Ask your local Dodge Distributor. Or write us for bulletin.

DODGE MANUFACTURING CORPORATION, 400 Union St., Mishawaka, Ind.

CALL THE TRANSMISSIONEER—your local Dodge Distributor. Factory trained by Dodge, he can give you valuable help on new, cost-saving methods. Look under "Dodge Transmissioneer" in the *white* pages of your telephone directory, or in the yellow pages under "Power Transmission Machinery."

DODGE
of Mishawaka, Ind.

Do you have a "beef"

about handling costs?

Here's how PAYLOADER® tractor-shovels take the *high* cost and *hard* work out of bulk handling

Manufacturer states their new H-25 "PAYLOADER" enabled them to "cut manpower needs for material handling by 70% . . . save time and demurrage charges unloading incoming forgings . . . devise a simple perpetual inventory system."

Metal Smelter Sup't. says, "Our H-25 'PAYLOADER' works 100 hours a week. Two typical examples of its money-saving versatility — doubled the tonnage on brass sorting while saving labor; unloads a truck of red brass in 20 minutes that used to take 12 man hours."

Lumber Mill owner states . . . "Our Hough units are indispensable. They keep things moving . . . unloading trucks, sorting out and piling logs, feeding the mill and moving finished lumber . . . and tie a rather scattered mill operation into a fast, efficient, modern plant.

Foundry Sup't. reports . . . "We tried an H-25 'PAYLOADER' and it gave us the productivity and economies without having to install conveyors and other costly material handling equipment."

Fertilizer Plant partner says . . . "The H-25 'PAYLOADER' is moving better than 25% more material than the previous model . . . its smooth operation assures cleaner floor conditions, faster delivery plus operator comfort and safety."

Owner Reports like these reflect the kind of money-saving performance that is built into all "PAYLOADER" units. There are 8 sizes and 20 models (2,000 to 12,000 lb. operating capacity) for every material handling need, indoors and out. If you're interested in lower costs and higher output in your bulk handling, why not talk "PAYLOADER" with a nearby Hough Distributor, or write us for more details.

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THE FRANK G. HOUGH CO.
755 Sunnyside Ave.
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SUBSIDIARY — INTERNATIONAL HARVESTER COMPANY

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12-A-2

FACTORY / EQUIPMENT NEWS

Begins on page 102

For more about these items, circle item numbers on Reader Service Card next to back cover.

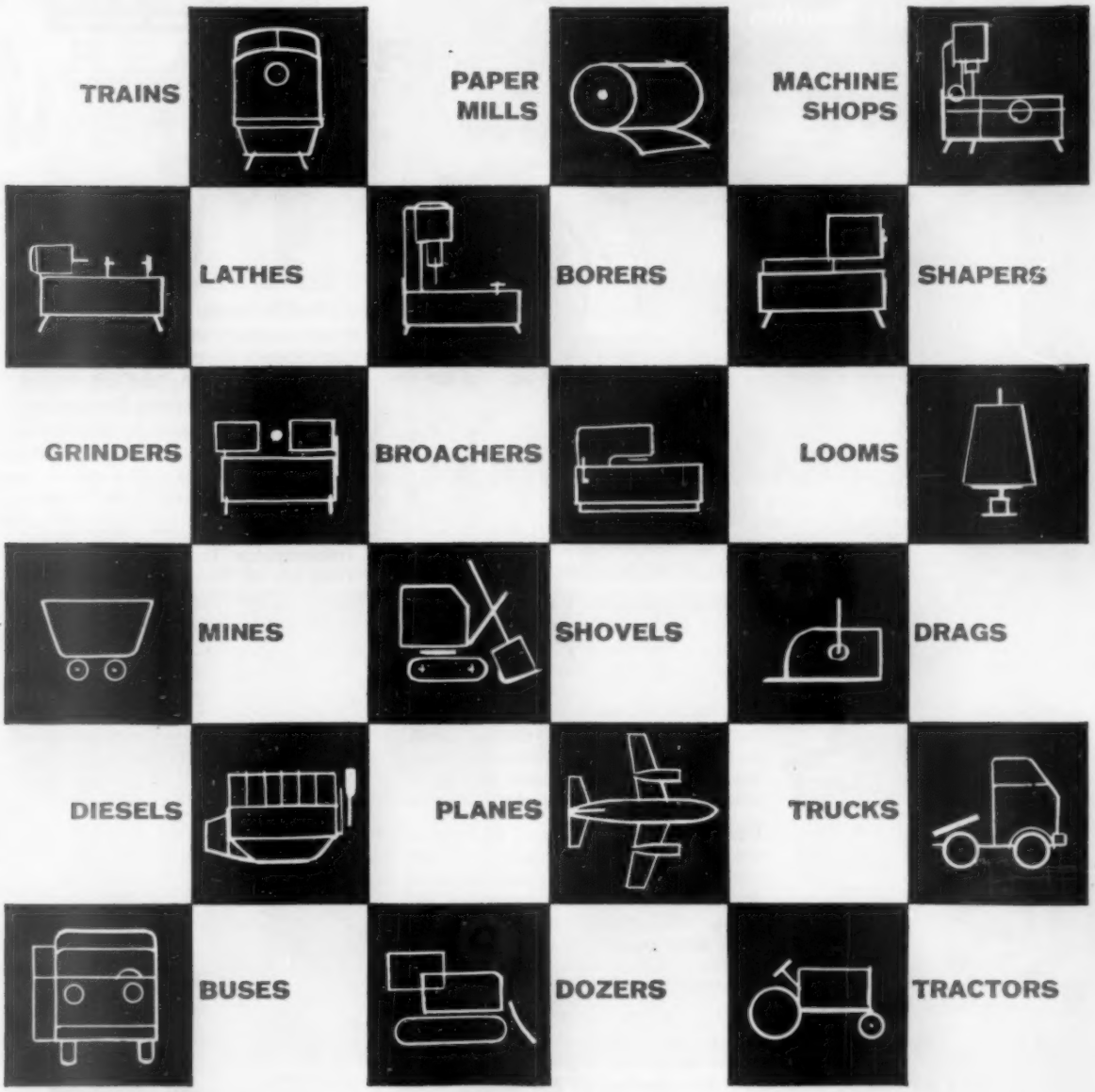
118—Work Platform rises automatically to 20-ft. at press of button. No ladder, no setting up, no loose parts. Electrically operated, it can be rolled easily by one man. Ideal for general overhead maintenance, painting, lighting, cleaning, etc. *Atlas Industrial Corp.*

119—Spring Tension Gage has range to 1200 grams in increments of 100. Range also shown in ounces to 2¾ lb. Extremely accurate, it checks tensions of relay or other springs on electronic equipment. Calibrated on front and back for easy reading. *P. K. Neuses, Inc.*

120—Message Recorder takes down and reproduces telephone messages relayed through automatic internal dial telephone system. When one machine records, the other transcribes. Records on plastic discs with 15-min. running time on each side. *The SoundScriber Corp.*

Turn the page

If you manage or operate any of these...



...your best move is to Sinclair's specialized greases, oils and lubricants, to cut costs, speed operations and increase profits. There are more than 500 of these money-savers, and each does its particular job particularly well. For helpful information based on actual experience, call your Sinclair Representative or write

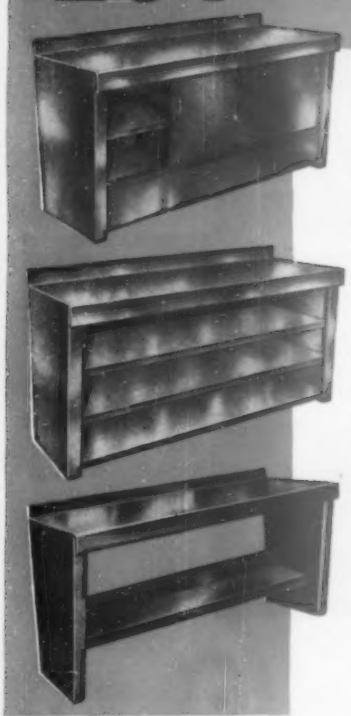
Sinclair

SINCLAIR REFINING COMPANY
Technical Service Division
600 Fifth Avenue, New York 20, N. Y. • CI 6-3600

For more facts Circle 430 on Reader Service Card

"For shape, size and working height Equipto Benches are just right"

264 models in stock



Equipto modern-flow Benches can easily be arranged into one continuous streamlined assembly which gives you custom designed features at assembly line prices. Available with many types and styles of drawers, drawer pedestals, cabinet pedestals, sliding doors, aerial shelves and a choice of 12 ga. steel, masonite, laminated maple or bonded wood tops in various lengths.

Equipto Bench drawer and door fronts are rounded top and bottom and have individual latch and padlock hasp with provision for number plate and key or combination lock. All drawers ride quietly on trouble-free nylon rollers. Pilfer-proof...contents cannot be reached by removing drawer above.

Now is the time to design that bench set-up you have been thinking about. Write today for big 16 page catalog No. 204 showing all 264 models.

SHELVING BENCHES DRAWER UNITS LOCKERS EQUIPTO ROBE STOCK CARTS EQUIPTO ANGLE

Equipto

812 Prairie Avenue
Aurora, Illinois

FACTORY/EQUIPMENT NEWS

Begins on page 102

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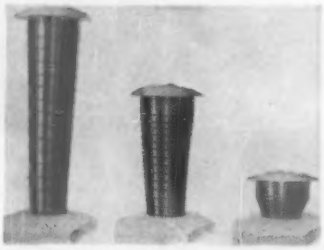
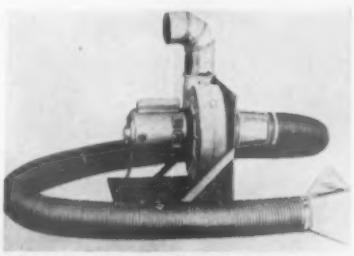


121—Elasticone Covers slip over precision parts to protect them from dirt, chips, nicks, scratches. Steel cone is self-aligning and self-adjusting due to its own spring-like tension. In 4- to 60-in. lengths for horizontal or vertical use. *Central Safety Equipment Co.*

122—Overload Relay automatically compensates for heat and cold. Operates on same time-curve at all temperatures from −20 to 165 F. Ratings 25 to 300 amp., continuous current. Manual or automatic reset. For indoor or outdoor use. *Arrow-Hart & Hegeman Electric Co.*

123—Mobile Generators, 60 and 180 cycles, come in ratings from 1000 to 3500 w. Single-phase, 115-v. a-c. units have two outlets and a pilot light socket as additional outlet. One model has automatic gas saver that idles engine when tools are not in use. *Champion Mfg. Co.*



124—Portable Air Exhauster removes 600 cfm. from welding, soldering, brazing operations. Used also as blower to cool overloaded equipment, ventilate man-holes and tanks, etc. Powered by totally enclosed ½-hp. motor, 115/230 v. *Cincinnati Fan & Ventilator Co.*

Turn the page

For more facts Circle 431 on Reader Service Card

For more facts Circle 432 on Reader Service Card ➤

THERE'S A REAL DIFFERENCE IN SAFETY-SWITCH SAFETY!

The *real* difference in safety . . . and the difference is *very* real . . . lies in switch performance under electrical load. You can spot this difference instantly when you compare the action of BullDog Vacu-Break® Safety Switches.

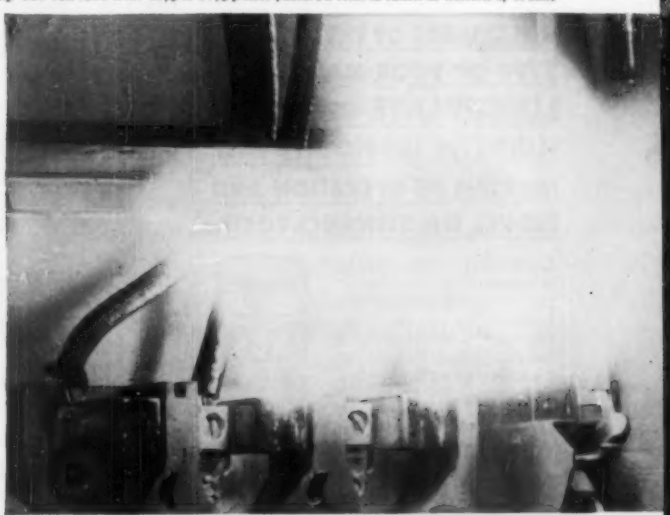
When you operate Vacu-Break Safety Switches under load, there is no blinding flash, no dangerous arc "explosion". The exclusive Vacu-Break design double-breaks the circuit, confines the arc within the enclosed switch head, smothers and extinguishes it instantly. Maintenance of contact points is virtually eliminated, and *you don't have to open the switch-box door to know the contact is broken.*

The operating handle is connected directly to the Vacu-Break heads. Push the handle "Off" and contact is broken positively every time. There are no toggles, triggers or springs to depend on. You know the switch is "Off" without looking.

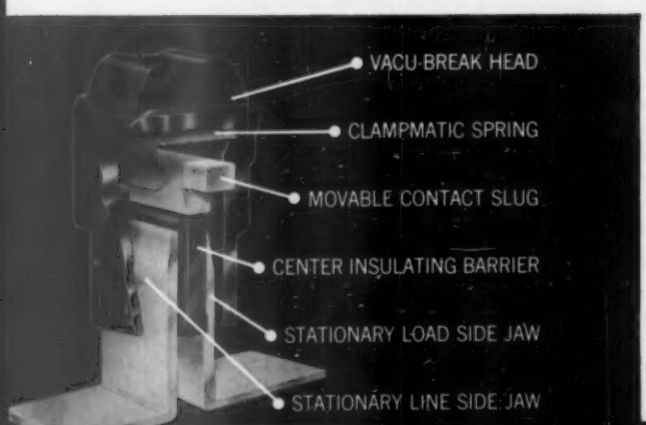
Clampmatic® assembly gives clamped pressure contact, speeds "break". This means positive, safe operation, and long, trouble-free switch life. In safety switches, the *real* difference in safety lies in design and performance. Compare BullDog Vacu-Break Safety Switches with other types, and then *see* the difference!

Unretouched photographs of the arc in 100-Amp 600-volt switches operating under 90-Amp 440-volt load with 40% to 50% power factor. Pictures taken at instant of break.

Vacu-Break Safety Switches confine dangerous, destructive arcs inside arc chambers, and smother them instantly.



Open knifeblade switches permit arc "explosions", burning and pitting contact points. The result—fire hazard and switch damage.



Cutaway of Vacu-Break switch head, showing movable contact slug inside arc-smothering closed chamber. Clampmatic spring assembly gives bolt-tight contact, speeds "break", increases switch life.

BullDog Electric Products Division, I-T-E Circuit Breaker Company, Box 177, Detroit 32, Michigan. In Canada: 80 Clayson Rd., Toronto, Ont. Export Division: 13 East 40th St., New York 16, N.Y.

For Safety's Sake—Buy Vacu-Break

BULLDOG ELECTRIC PRODUCTS DIVISION
I-T-E CIRCUIT BREAKER COMPANY

®

"THIS LUBRICANT SAVED US $2,098·16 IN SEVEN MONTHS"

—says THE BROWN COMPANY
Quality Paper Makers of Berlin, N. H.

"During a seven-month period before using LUBRIPLATE No. 130-AA in the bearing of our Kraft Mill Lime Kiln, we used a conventional oil at a cost of $2,134.00. In the seven months that followed, we used LUBRIPLATE No. 130-AA for initial filling and replacement at the cost of $35.84."

REGARDLESS OF THE SIZE AND TYPE OF YOUR MACHINERY, LUBRIPLATE GREASE AND FLUID TYPE LUBRICANTS WILL IMPROVE ITS OPERATION AND REDUCE MAINTENANCE COSTS.

LUBRIPLATE is available in grease and fluid densities for every purpose . . . LUBRIPLATE H. D. S. MOTOR OIL meets today's exacting requirements for gasoline and diesel engines.

For nearest LUBRIPLATE distributor see Classified Telephone Directory. Send for free "LUBRIPLATE DATA BOOK" . . . a valuable treatise on lubrication. Write LUBRIPLATE DIVISION, Fiske Brothers Refining Co., Newark 5, N. J. or Toledo 5, Ohio.

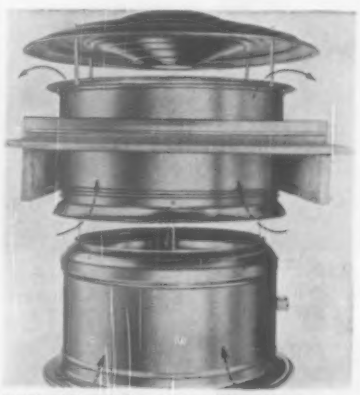
FACTORY/EQUIPMENT NEWS

Begins on page 102

For more about these items, circle item numbers on Reader Service Card next to back cover.

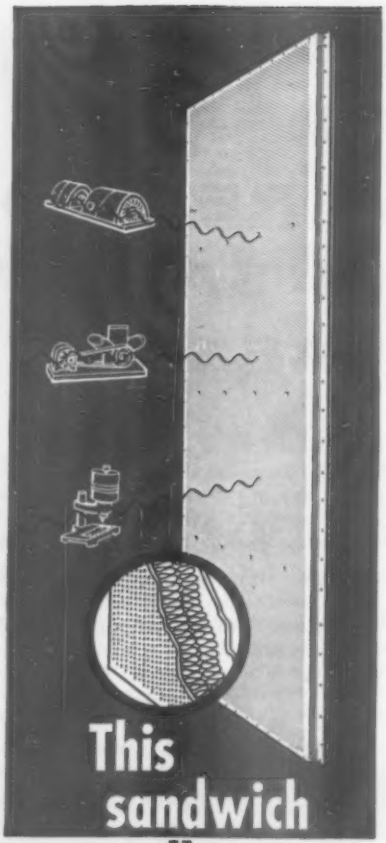
125—Web Belt Slings, of nylon and Dacron, are lightweight and unaffected by mildew, rot, bacteria, water or low temperatures. Provide safe duty to 8-10% elongation. In widths to 12 in. for nylon, 6 in. for Dacron, wider on special order. *Jones & Laughlin Steel Corp.*

126—Silicon Rectifier Welder, a-c/d-c, has full 100% duty cycle. Rated at 500 amp. Designed to replace 600-amp. motor-generator sets on semi-automatic submerged arc-welding applications. Ideal for large butt and fillet welds used on heavy metals. *A. O. Smith Corp.*



127—Dual-Purpose Ventilator recovers heat trapped under roof line and returns it to floor area for savings in fuel costs. In summer, unit exhausts contaminated air by simply positioning selective control switch. Comes in 3000- to 23,000-cfm. range. *N. T. W. Corp.*

Turn the page



swallows noise

This is an Eckoustic Panel — a very special sandwich, made of two layers of steel wrapped around a blanket of Fiberglas.

You can use it as a modular building block to build a soundproof room or plant office — a machinery enclosure — a production test facility — or, for that matter, practically anything where you must shut noise out, or seal it in.

Eckoustic panels protect employees from the harmful effects of exposure to continual noise . . . increase employee efficiency by creating more comfortable working conditions. And we have the results of acoustical studies which show they do it more effectively than other types of acoustical panels.

We also have a free folder that tells how Eckoustic Panels can help you solve sound control problems faster and more economically than you may have thought possible.

Let us send you the complete information without obligation.

Write:

THE Eckel CORPORATION

155 Fawcett Street, Cambridge 38, Mass.

During our periodic fire drills at Gillette, a Gamewell fire alarm system has proved itself much faster, much more trouble-free than the one it replaced. We appreciate the excellent protective value of the Gamewell system and your aid in engineering it to cover all buildings in our plant area.

Howard P. Spaulding
Chief Electrical Engineer
Gillette Safety Razor Co.
Gillette Park, Boston, Mass.

At Gillette it's GAMEWELL

. . . industrial leader installs the leading fire protection system

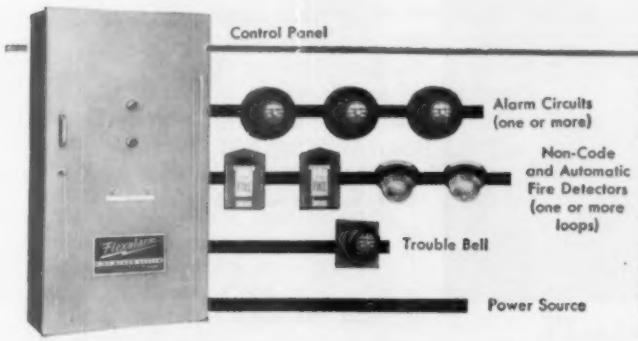
The Gamewell system endorsed by Engineer Howard Spaulding was carefully designed to protect all lives and property in Gillette's 11 buildings — headquarters of the internationally known manufacturer of razors, blades and other products.

A Gamewell system can be engineered to safeguard your own business from fire losses — including not only irreplaceable human lives but buildings and equipment that can't be renewed at their original costs. It will warn all personnel, signal your local fire department and, if required, will include fire detection units that activate the entire system — instantly — automatically.

Ask your Consulting Engineer about these advantages. Also, a Gamewell Fire Protection Engineer will be glad to give you details about installation requirements, performance and price. Send the coupon below for this service and/or a Gamewell technical manual — without obligation.

BLISS Gamewell®

FIRST . . . WHEN SECONDS COUNT!


Control Panel
Alarm Circuits (one or more)
Non-Code and Automatic Fire Detectors (one or more loops)
Trouble Bell
Power Source

THE GAMEWELL COMPANY
1611 Chestnut Street
Newton Upper Falls 64, Mass.
A Subsidiary of E. W. Bliss Co.

☐ Have a Gamewell Fire Protection Engineer call
☐ Send me a Gamewell Fire Alarm System Planning Guide

Name.....
Title.....
Firm.....
Address.....
City.....*Zone*....*State*.....

THIS FREE BOOK COULD HELP PREVENT AN ACCIDENT WHERE YOU WORK

You owe it to yourself, and the men you supervise, to learn all about the safety, comfort, and economy of USS Multigrip Floor Plate. This free booklet illustrates the many applications for Multigrip—from plant floors to derrick platforms to ship ladders. What you see in these pages may prevent an accident in *your* future.

Ask for the USS Multigrip booklet at your nearest Steel Service Center or U. S. Steel district sales office. Or write to United States Steel, Room 6173, 525 William Penn Place, Pittsburgh 30, Pa.

USS is a registered trademark

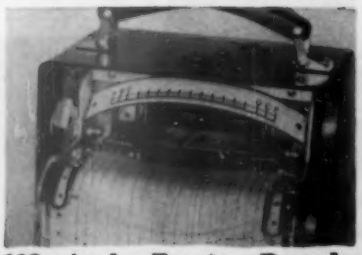
United States Steel Corporation—Pittsburgh
Tennessee Coal & Iron—Fairfield, Alabama
Columbia-Geneva Steel—San Francisco
United States Steel Export Company
United States Steel

This mark tells you a product is made of modern, dependable Steel.

FACTORY / EQUIPMENT NEWS

Begins on page 102

For more about these items, circle item numbers on Reader Service Card next to back cover.



128—Analog-Events Recorder measures a-c or d-c voltages or current on center portion of 6-in. strip chart. Six electrically-operated pens (on chart's side margins) can be synchronized to show on-off time of related events. Also times pulses. *Esterline-Angus Instrument Co.*

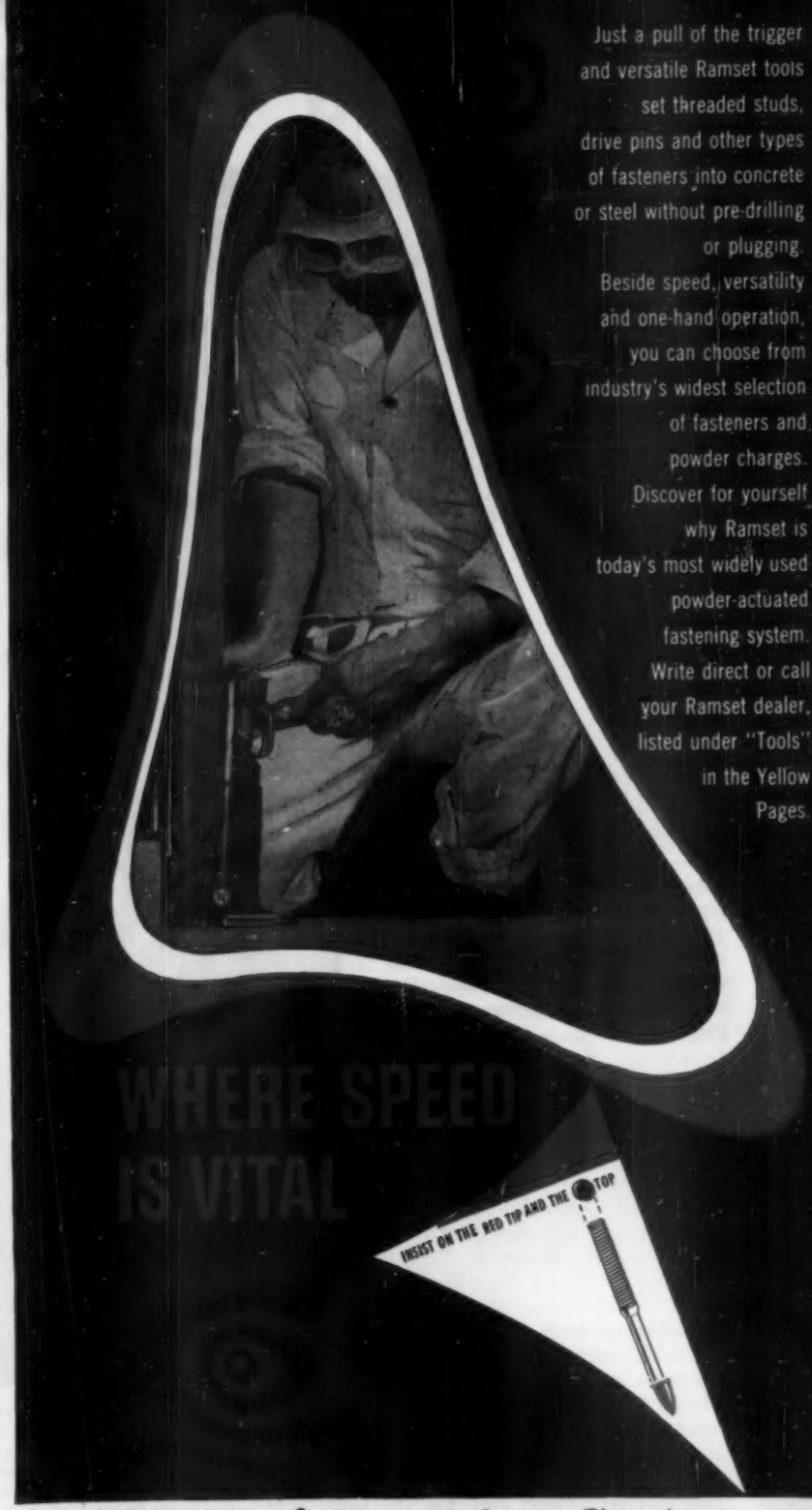
129—Moisture Indicator detects dewpoint down to −150 C. with sensing probe hundreds of feet from measuring instrument. For continuous readout or random samplings. Extremely sensitive, yet unaffected by most dust conditions, atmospheres. *Atkins Technical Inc.*

130—Thickness Gauge measures coating (to ¾ in.) on iron and steel simply by applying 2-pole probe to surface. For piston rings, screws, pipes, etc. Compact, portable unit comes in two models with scales ranging from 0.0008 to 0.100 in. *Twin City Testing Corp.*

Turn the page

Circle 437 on Reader Service Card ➤

Cost-conscious maintenance men use Ramset



Just a pull of the trigger and versatile Ramset tools set threaded studs, drive pins and other types of fasteners into concrete or steel without pre-drilling or plugging. Beside speed, versatility and one-hand operation, you can choose from industry's widest selection of fasteners and powder charges. Discover for yourself why Ramset is today's most widely used powder-actuated fastening system. Write direct or call your Ramset dealer, listed under "Tools" in the Yellow Pages.

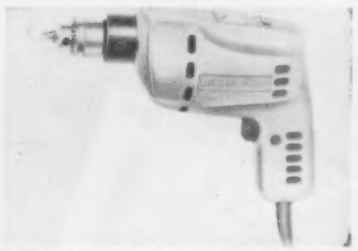
Ramset® Fastening System

OLIN MATHIESON CHEMICAL CORP. • WINCHESTER-WESTERN DIV. • 208-L WINCHESTER AVE. • NEW HAVEN 4, CONN.

For more about these items, circle item numbers on Reader Service Card next to back cover.

131—Heat Tool softens solvent-resistant thermoplastic pipe and fitting to permit joining without cement or threads. In seconds produces permanent leakproof bond ready for pressurization. Portable aluminum tool can be used in field or in close quarters. *Tube Turns Plastic Inc.*

132—Cable Support System, for tubing, power and control cables, or pipes, comes with openings spaced 1¾-in. apart for ventilation and easy drop-outs. In 6-, 9-, 12-, and 18-in. widths, openings have rounded edges to prevent cable damage. *Chalfant Products Co.*



133—Shockproof Nylon Drill, ¼ in. size, is 20% lighter than comparable aluminum drills. Offers double insulation for greater safety. Besides internally insulated motor, has insulated chuck and nylon housing. If motor breaks down, operator is safe from current. *Millers Falls Co.*

Turn the page

HOW PHILCO'S KEEPS

PHILCO'S 8-STUB TICKET — shown actual size — provides 5 sources of data for automatic processing of Daily Reports of: Production Count by Model and Type, Production vs. Warehouse Receipts, Warehouse Inventory by Model and Location, Shipments by Model, Relief of Inventory and Sales by Model. The other three stubs, permanently attached to each set and its carton, make identification quick, easy and accurate.

UNIQUE CONTROL SYSTEM
93% CLOSER TRACK OF TV SETS

THE HEART OF PHILCO'S SYSTEM is the Finished Goods Control Center, directed by Walter Wagg. Here, large quantities of tickets are processed by Dennison Print-Punch Machines to provide the multiple checks which keep close tabs on Philco TV sets. Here, too, stubs are counted and matched when returned from production, warehousing and shipping departments.

EACH STUB TELLS THE TRUTH! From production through shipping and everywhere in between, the disciplined removal and matching of Dennison Print-Punch Ticket stubs compiles an accurate history of each TV set's movement and location.

"Lost" TV sets used to be a Philco problem. "Paper losses" were not uncommon. They were caused by misprinted, mislaid or misread tags. Since 1956, however, all that has been changed. Annual inventory losses have been reduced by 93% to 96% . . . thanks to a Dennison Print-Punch System.

Now . . . accurate finished goods control is automatic! Production receives its daily supply of 8-stub Print-Punch tickets. Three stubs remain attached to each set and its carton and identify it until sold at retail. The other five stubs, removed at pre-determined points, are automatically processed to provide an accurate history of the set's movement and location. According to Walter Wagg, in charge of the system since its start, "Results are excellent . . . errors are few and easily corrected . . . inventory control is very reliable."

For complete details about Philco's system . . . and other cost-cutting Dennison Print-Punch applications . . . write for our fact-packed brochure. Or, contact the Dennison sales office nearest you.

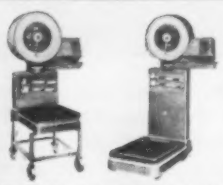
Dennison

Helping you compete more effectively

FRAMINGHAM, MASSACHUSETTS

TOLEDO SCALES that PRINT Complete Weight Records for You . . .

. . . THE ANSWER to prevent "guesswork" and errors in cost control!


BENCH SCALE PORTABLE SCALE

FLOOR SCALE

Toledo Printweigh Scales are available in a full range of models, including Built-in Hopper, Tank, Overhead Track and Motor Truck Scales, in addition to the models illustrated above.

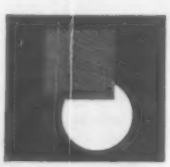
Human errors in reading, remembering and recording weights are eliminated with Toledo Printweigh "400" Scales. They're the surest way to satisfy your requirements for weight records that are complete and indisputable.

Weights are printed in full figures, even when unit weights are used. Choice of printing on 8½" x 11" forms, or on tickets; also on strips. Weight data may be transmitted electrically for recording on remote adding or other office machines. "Memory" feature available for printing weight data, even after load is removed.

Toledo Printweigh "400" Scales give new flexibility and efficiency in weighing . . . to cut costs, guard quality, prevent profit-stealing weighing errors. Ask your Toledo representative for the full story on Printweigh Scales, or WRITE TODAY FOR BULLETIN 2017. TOLEDO SCALE, Division of Toledo Scale Corporation, Toledo 12, Ohio
(Toledo Scale Co. of Canada, Ltd., Windsor, Ont.)

"MISFIT" SCALES MULTIPLY COSTS

Scales can become "misfits" as a result of changes in plant layout, materials handling, inventory controls, value or quantity of materials weighed. If this has happened in your plant, the results can be costly. For example: weighing errors, production bottlenecks, materials handling inefficiencies. Be sure your scales are adequate for the job. Ask your Toledo representative about a scale adequacy check in your plant, or send for the Toledo Weight Fact Kit.



SERVICE

TOLEDO® *Headquarters for Weighing Systems*

FACTORY/EQUIPMENT NEWS

Begins on page 102

For more about these items, circle item numbers on Reader Service Card next to back cover.

134—Stainless Steel Pump has self-lubricating, leakless and virtually wearproof "Remite" seals. Quiet operation. No shaft vibration. Disassembles quickly for servicing; no need to disturb pipe connections. Capacity: to 220 gpm., heads to 120 ft. *Bell & Gossett Co.*

135—Thermistor Thermometer in two models: one covers −40 to + 150 C.; other, −40 to + 300 F. Interchangeable probes measure liquids, gases, semi-solids, or surfaces directly or remotely. Easy-to-read meter. Portable, transistorized. *Yellow Springs Instrument Co.*

136—Process Regulator electronically regulates flow, controls temperature, positions valves precisely. Three models in ranges from 30-in. Hg. vacuum to 5000 psig., to accuracy of ± 0.006 psig. Also in custom-made units. Six pipe sizes. *Physics for Industry, Inc.*

137—Reflect-All Illuminator provides low-cost, concentrated yet diffused light for inspecting small components, close-up production work, machinery inspection, tool and die work. For use with 25- or 40-watt bulb. Has removable spot lens. *Edmund Scientific Co.*

Turn to page 124

For more facts Circle 439 on Reader Service Card

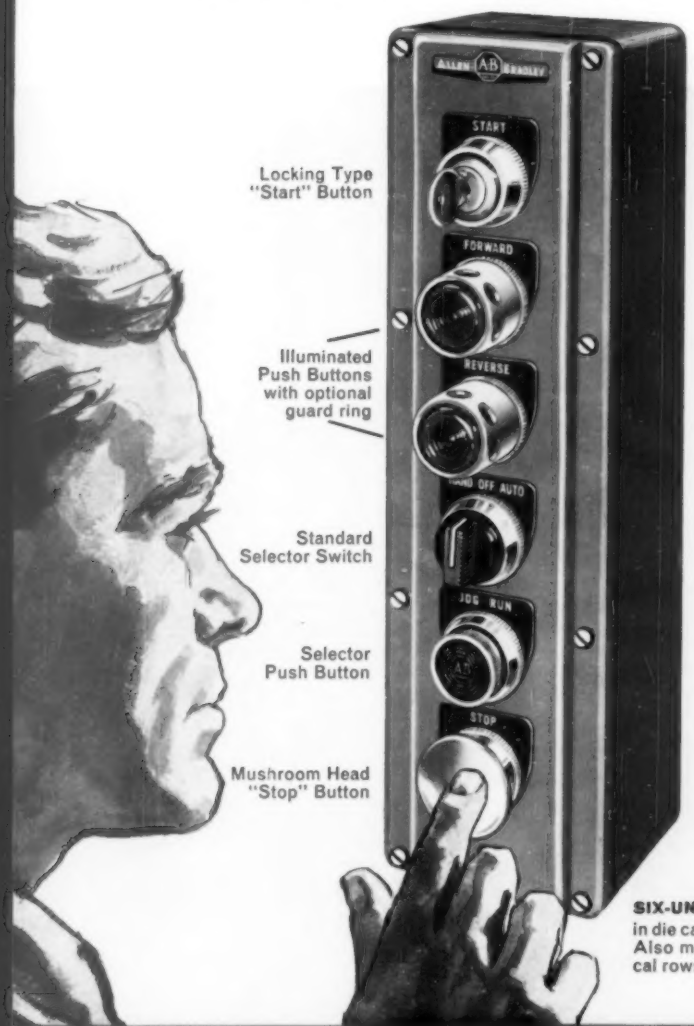
For more facts Circle 440 on Reader Service Card ➤

BE SURE YOU GET

Quality Appearance Quality Operation

Specify Allen-Bradley's line of ***OILTIGHT CONTROL STATIONS***

Allen-Bradley oiltight units and stations harmonize with the trim lines of modern machine tools —they look as if they were a part of the machine. Also, from the wide selection of control units, you'll be able to satisfy every operating requirement. A-B control units are positively oiltight—impossible for oils and cutting fluids to foul the contacts. And the silver contacts assure reliable operation. The rugged construction and generous wiring room of all A-B stations are valued by the installation engineer. Insist on Allen-Bradley pilot control units and stations—you can't make a mistake! Send for Publication 6090.



FLUSH HEAD
push button, also made with extended head.

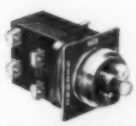
WING LEVER PUSH BUTTON
Combines push button and selector switch.

PUSH-TO-TEST PILOT LIGHT
Six different color lenses available.

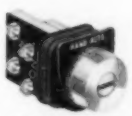
4-WAY SELECTOR SWITCH
Also furnished for 2-way operation.

PILOT LIGHT
Transformer or full voltage types.

DOUBLE CIRCUIT
Has 2 N.O. or 2 N.C. sets of contacts.



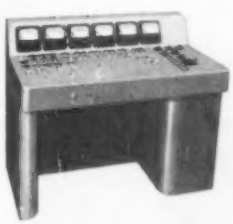
PILOT LIGHT CLUSTER
Four lights of different colors in one unit.



SELECTOR SWITCH
With coin slot operator. Other operators available.

CONVENIENCE RECEPTACLE
For plugging in work light or small tools.

SPECIAL CONTROL CONSOLES
can be furnished to meet your exact operating requirements.



SIX-UNIT CONTROL STATION
in die cast aluminum housing. Also made with up to 4 vertical rows with 4 units per row.

31-60-RM

ALLEN-BRADLEY

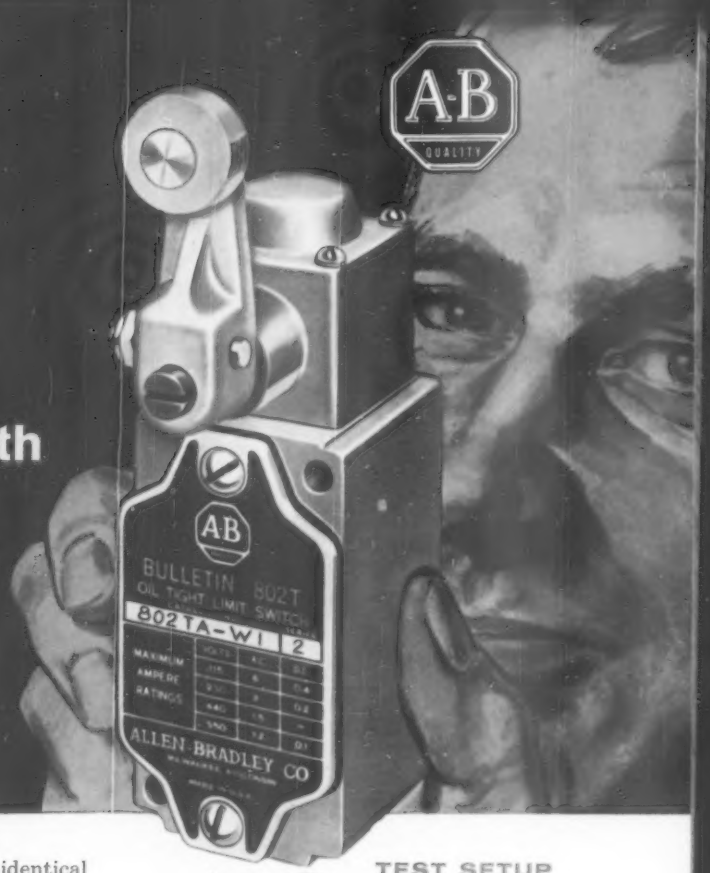
Member of NEMA

Allen-Bradley Co., 1316 S. Second St., Milwaukee 4, Wis. • In Canada: Allen-Bradley Canada Ltd., Galt, Ont.

QUALITY MOTOR CONTROL

Only ALLEN-BRADLEY LIMIT SWITCHES FINISHED TEST with *NO FAILURES!*

...and remained good for many more millions of trouble free operations

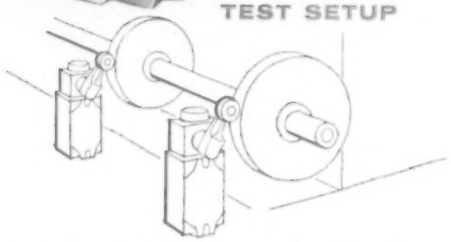


Recently, a large user of limit switches selected two identical units from each of five leading manufacturers and subjected them to the same accelerated life test. When the test was stopped after many, many millions of operations, only Allen-Bradley Bulletin 802T oiltight limit switches were left *with no failures!* Also, a careful inspection of these two Bulletin 802T limit switches suggested that they were still good for *many more millions* of operations.

The Allen-Bradley "built-in" quality is the reason for such unmatched performance. With switch bodies and operating heads positively sealed against oil and dirt, A-B Bulletin 802T limit switches are free from contact fouling and sluggish operation. The precision switch mechanism has a positive snap action—it is impossible for vibration to cause contact chatter. The double break, silver contacts never need servicing.

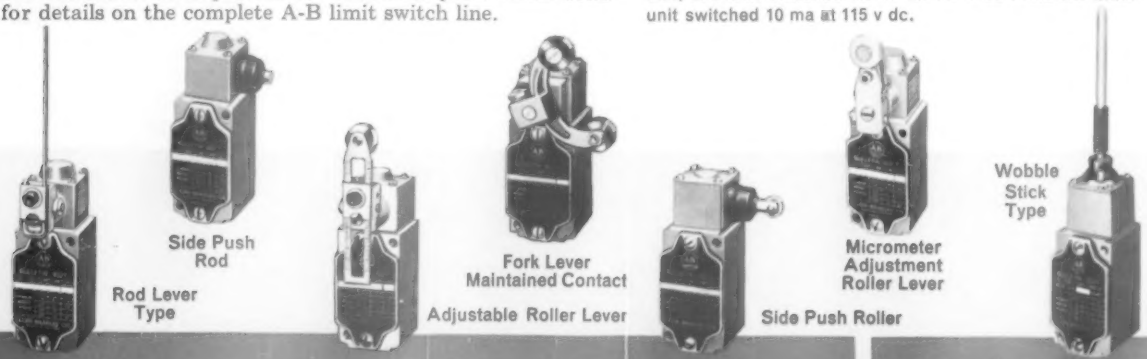
Insist on Allen-Bradley Bulletin 802T oiltight limit switches—they will *always* provide you with the long, trouble free life that is so important to continuous production. Send for details on the complete A-B limit switch line.

TEST SETUP



Purchased through regular supply channels . . .

and tested under identical conditions, insuring an impartial evaluation of performance. Of the ten limit switches tested (two each of five different makes), only three were operating when the test was stopped. Two were A-B Bulletin 802T switches and one of another make, of which the second unit had failed early in the test. On this accelerated life test, one unit switched 1.0 ma at 115 v dc while the other unit switched 10 ma at 115 v dc.



ALLEN-BRADLEY

Member of NEMA

Allen-Bradley Co., 1316 S. Second St., Milwaukee 4, Wis. • In Canada: Allen-Bradley Canada Ltd., Galt, Ont.

QUALITY MOTOR CONTROL

When towels come one at a time they all get used

NEW Steiner Serva-Matic dispenser delivers one unfolded paper towel at a time. No buttons, cranks, levers or tear off required.

A few seconds will elapse before the next towel comes out of this Steiner automatic dispenser. Means the first towel will be used before the second can be taken. When this happens every time someone dries his hands you can see the result: Fewer towels are used . . . waste is reduced . . . towel costs go down (as much as 30%). All Steiner cabinets have an adjustable control you can set to dispense towels at the rate you want . . . at the best rate to keep washroom traffic moving and to keep employees and customers satisfied. For details write . . .

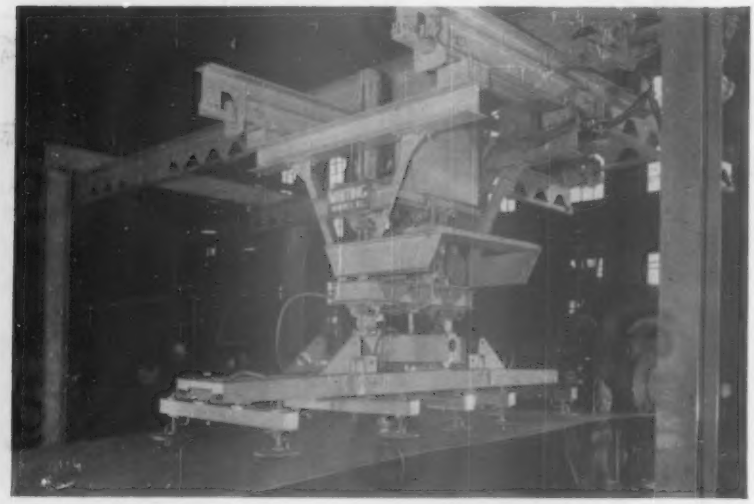
STEINER

STEINER COMPANY

Dept. 60-5, 740 Rush Street • Chicago 11, Illinois

For more facts Circle 441 on Reader Service Card

WE HELPED PULLMAN-STANDARD SOLVE A WEIGHTY PROBLEM BY USING PRESSUREGRIP

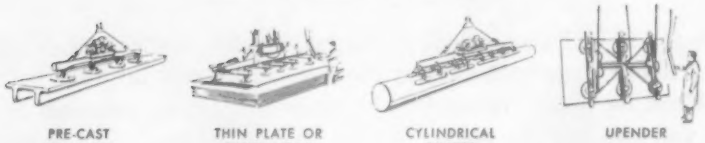


Feeding heavy steel plate into a shear was tough, tedious work at Pullman-Standard. Men were hard to get for the job and twice as hard to keep. Pullman called on Whiting engineers to discuss the problem.

Now, Whiting Pressuregrip combined with a Trambeam crane uses vacuum to move steel plate into the shear automatically. Cost reduction, more efficient use of man hours, greatly increased safety and far better employee morale have resulted.

Your plant can snap up production and cut costs by speeding up in-process material handling with Pressuregrip. We'd like to tell you how.

POSITIVE, SAFE HANDLING OF PRACTICALLY ANY MATERIAL, ANY SURFACE



PRE-CAST CONCRETE | THIN PLATE OR SHEET-WOOD | CYLINDRICAL SHAPES | UPENDER

Want details on the Pressuregrip installation above? Write for bulletin V-102. 15689 Lathrop Ave., Harvey, Illinois

See our catalog in Sweets

90 OF AMERICA'S "FIRST HUNDRED" CORPORATIONS ARE WHITING CUSTOMERS

PRESSUREGRIP

WHITING

MANUFACTURERS OF CRANES; TRAMBEAM® HANDLING SYSTEMS; PRESSUREGRIP; TRACKMOBILES®; FOUNDRY, RAILROAD, AND SWENSON CHEMICAL PROCESSING EQUIPMENT

FACTORY/EQUIPMENT NEWS

Begins on page 102

For more about these items, circle item numbers on Reader Service Card next to back cover.

138—Portable Pow-R-Drive, electric or air-driven, opens and closes valves and operates hand winches easily. Weighs 38 lb.—can be handled by one man. Rotates at 20 rpm. in either direction. Safety controls shut off unit if it gets away from operator. *E. H. Wachs Co.*

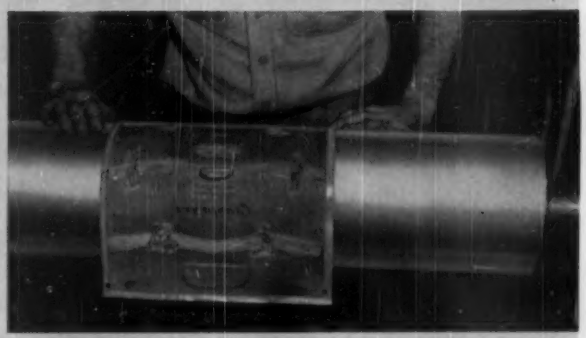
139—Portable Torque Tester, for power or hand-operated tools with torque controls, detects any variation from preset torque output. Two models with 0-30 and 0-60 in.-lb. ranges. Accurate to ± 3% for dynamic or static tests. Easy-to-read dial. *Scully-Jones & Co.*

140—Rotating Connector (2½-in. diameter by 5-in. long) allows electrical current to pass through continuously rotating parts. No twisting or tangling of lines. Accepts rigid conduit, flexible B-X cable, heavy-duty wiring for single or 3-phase motors. *Ward-Riddle Co.*

Turn the page

HOLD IT!

...with a powerful Polyken 2-face tape



Airliners, flexography, window display, what have you ... Polyken bonds two surfaces hard and fast

Bringing two surfaces together in a semipermanent bond is a simple low-cost job when you trust Polyken's double-faced tape—one of the most versatile tapes you can buy.

It has the highest holding power, users report, of any double-faced tape. Yet it can be neatly removed at any time. Airlines, as the left-hand photo shows, rely on Polyken to economically secure cabin carpets—for neatness and passenger safety.

So strong it holds rotary printing plates

Flexographers, as shown in the photo at upper right, count heavily on Polyken to keep plates from shifting or distorting. For such a chore, the wide variety of widths offered by Polyken comes in quite handy. Even window dressers, lower right photo, depend on this tape for solutions to a variety of problems.

If you have any problems that resemble these—however remotely—contact your Polyken representative.

Find Your Nearest Distributor In The 'Yellow Pages'

Polyken®

INDUSTRIAL TAPES

THE KENDALL COMPANY
Polyken Sales Division

LOUISIANA

where Industrial Climate means PEOPLE!

Welcome to a population that's industry-minded . . . a stable, easily trained labor force that's proud to offer a good day's work for a day's pay. Louisiana's *people* supported the creation of the State Department of Commerce and Industry in 1936, supported its pioneering 10-year *ad valorem* industrial tax exemption. Enjoy the benefits of a hospitable people and a cooperative state. Louisiana's Department of Education provides special training for employees of new business and industry . . . Louisiana's Employment Security Division will conduct surveys of available labor, help interview and screen employees. Such benefits are an idea why we say, "In Louisiana, *Climate* is a lot more than just weather."

Every section of Louisiana has: SIZABLE COMMERCIAL CENTER/ABUNDANT FRESH WATER/ACCREDITED UNIVERSITY OR COLLEGES, GOOD SCHOOLS/TRADE SCHOOLS/GOOD TRANSPORTATION/LOW COST POWER AND FUELS

Write for new booklet, "Louisiana Invests in Industry." Other information available . . . each inquiry receives individualized handling.

LOUISIANA DEPARTMENT OF COMMERCE & INDUSTRY
SECOND FLOOR · BATON ROUGE 4, LOUISIANA

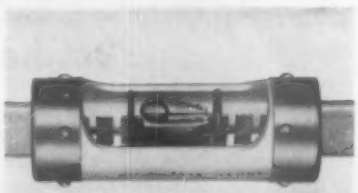
FACTORY/EQUIPMENT NEWS

Begins on page 102

For more about these items, circle item numbers on Reader Service Card next to back cover.

141—Mobile Wall Washer, made of stainless steel, is rustproof, weighs 25 lb. Uses detergent requiring no rinsing—leaves surface ready for repainting. No streaks, cannot harm paint, sanitizes, odorless. One man can clean 6000 sq. ft. a day. *Von Schrader Mfg. Co.*

142—Air Ventilator-Heater replaces air exhausted in processing operation by drawing it from outside, then heating to 80 F. before distribution. Comes in 7x7x8-ft. enclosure, 20,000 to 80,000 cfm. capacities. Gas-operated burner, safety controls. *Midland-Ross Corp.*



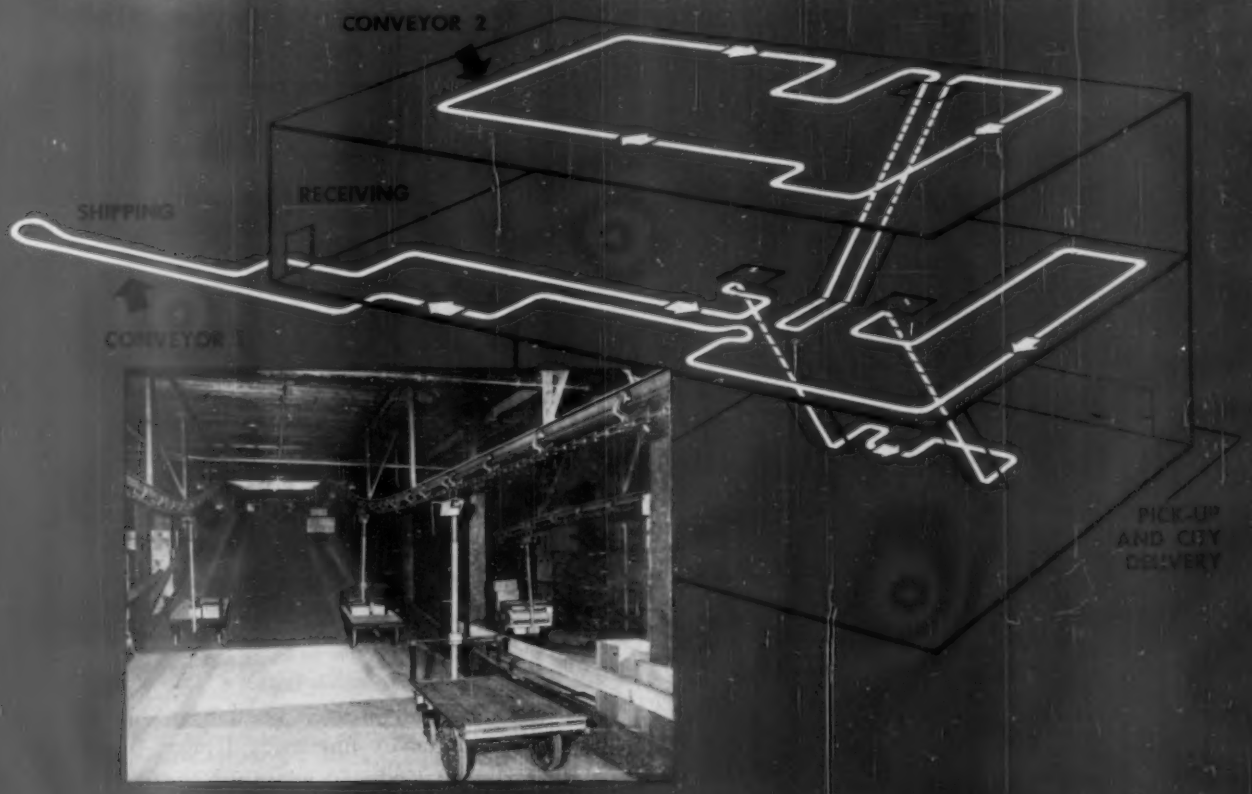
143—Dual Element Fuses, 250 to 600 v., has heat-sink jaws that snap open when heat nears 300 F. Time delay of thermal cut-out element prevents blows from temporary surges (motor starts). Rugged fuse-link element blows fast on short circuits. *El-Tronics, Inc.*

Turn the page

For more facts Circle 444 on Reader Service Card

For more facts Circle 445 on Reader Service Card ➤

WEBB TOW-CONVEYOR SYSTEM



Modernizes Handling In Three-Story Warehouse

FASTER travel from loading to unloading areas
EASIER—truck movement from docks to storage is unattended
ECONOMICAL—more material handled per man hour
LIVE STORAGE on trucks reduces required dock area
EFFICIENT WAREHOUSING—more uniform flow, better inventory control, fewer personnel

In an existing 360,000 square foot warehouse, how do you modernize the handling of 40,000 different hardware items stored on three floors? Here's how a Webb Tow-Conveyor system efficiently answered the problem for the Stratton Warren Hardware Company in Memphis, Tennessee.

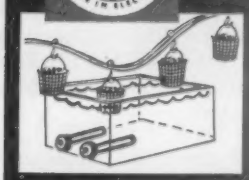
Two overhead tow-conveyor lines were installed to provide continuous "loop" type travel of warehouse trucks. Both conveyors travel at a constant speed of 85 F.P.M. and tow-trucks can be attached on 16-foot centers. Thus, the entire system has a capacity of 255 tow-trucks carrying an average load of 600 pounds each.

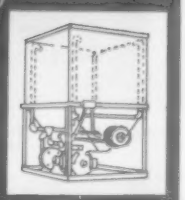
Conveyor number one (see schematic drawing above) serves "pick-up and city delivery", shipping dock, basement area and first floor warehousing area. Note at top of two 9° ramps connecting basement to first floor, conveyor one is in close proximity to conveyor two. This permits quick and easy transfer of tow-trucks from one conveyor line to the other. From the first floor, conveyor number two tows trucks up and down a 12° ramp and around the second floor. Fixed travel pattern of tow-trucks was established to provide maximum convenience and efficient handling in all areas of warehouse.

To assure controlled safe towing of trucks up and down the ramps, rigid telescoping masts were attached to each tow-truck and a specially designed engagement box was mounted to bottom of conveyor trolleys. The upper end of the mast slides into the trolley box and is automatically locked in place—a simple manual pull on box release lever disengages the mast. The telescope construction of the mast permits lowering for entrance into highway trucks. Convenience and efficiency are evidenced everywhere in this modern handling system.

Mr. Leslie M. Stratton, President, says: "The conveyor works perfectly and we are well satisfied. My only regret is that we did not have the conveyor installed ten years ago."

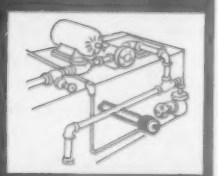
WEBB
JERVIS B. WEBB COMPANY
8939 ALPINE AVENUE · DETROIT 4, MICHIGAN
SPECIALISTS IN CUSTOM CONVEYOR SYSTEMS





Cleaning and degreasing solutions.

Quenching oil.



Forced-pressure lubricating systems.

. . . and hundreds of other applications

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CHurchill 2-6400

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Just drill one hole and install threaded pipe coupling in tank, then screw in the Chromalox Immersion Heater. Built-in thermostat automatically maintains uniform temperature of water, oils, wax, various solutions. Several styles available, for different applications. Elements sheathed in copper or steel. Standard ratings: ¾ to 10 kw, 120 or 240 volts. Thermostat range: 50° to 550°F. Inside-tank from 6¼″ to 48″. Available with explosion-resistant and moisture-resistant terminal box.

For more details, call your Chromalox Sales-Engineering Representative, or write us for Bulletin PD105, which contains specifications and prices. 88807

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KANSAS CITY, MO. Victor 2-3306
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SOUTHFIELD, MICH. Kenwood 8-2100 Elgin 7-0677
SYRACUSE, N.Y. Granite 4-3933
WICHITA, KAN. Amherst 2-5647

For more facts Circle 446 on Reader Service Card

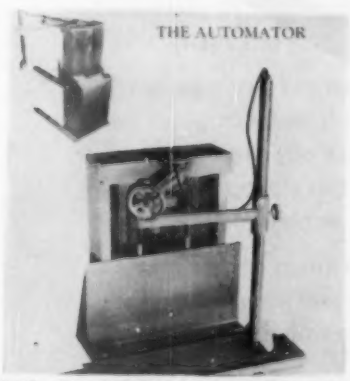
FACTORY/EQUIPMENT NEWS

Begins on page 102

For more about these items, circle item numbers on Reader Service Card next to back cover.

144—Motion Detector is a simple-to-install plant-protective system. Radio waves cover area under surveillance. Audible and visual alarms are set off at central station (remote if needed) when waves are disturbed. Swami has sensitivity adjustment. *Singer-Bridgeport.*

145—Wireless Intercom plugs into outlet to permit four separate conversations at once in complete privacy. Eight 8-channel sets can be installed in 10 min. without costly wiring. Has automatic volume control, static eliminator. *Feiller Engineering & Mfg. Co.*



146—Stacker-Feeder converts manually fed and discharged production equipment to automatic operation. Adjusts itself horizontally and vertically to workpiece size and placement. Handles delicate material or pieces of irregular sizes, thicknesses. *Machines & Mechanisms, Inc.*

Circle 447 on Reader Service Card ➤

"Tough buyers" demand Reznor

REZNOR DUCT FURNACES

cut installation and maintenance costs

Note the features that make Reznor duct furnaces more adaptable, cut installation time and costs:

- mounting pipes at all four corners permit easy suspension or base mounting;
- double-lip flange simplifies air-tight connections;
- air can flow through heat exchanger in either direction;
- controls can face each other when heaters are in tandem;
- built-in draft diverter is reversible;
- flue collar is interchangeable for horizontal or vertical installations.

These features insure long-run economy, easy maintenance:

- Reznor furnaces have long-lasting, corrosion-resistant aluminized or stainless steel heat exchangers and non-clogging steel burners, easily accessible from front or rear;
- every furnace is flame-tested and shipped complete with U/L approved controls.

Whatever system you're planning—central heating, year-round air conditioning, make-up air, process air—Reznor fills any requirement. Heaters may be used singly in capacities up to 300,000 Btuh, or in tandem or side-by-side arrangement for greater heating requirements. Reznor blowers available. Ask your Reznor representative for Catalog SA-5900. Or write Dept. 75-V, Reznor Manufacturing Co., Mercer, Pa.

REZNOR HEATERS

"WORLD'S LARGEST SELLING DIRECT-FIRED HEATERS"

A reindeer brings you Season's Greetings when you write to

SANTA CLAUS

(specialist in world peace)

A Field Engineer brings you profitable ideas when you write to *LINCOLN*

(specialists in arc welding)

WRITING to Santa Claus is an exciting experience for the whole family. Eager faces . . . pencilled lists . . . crackling fire . . . and the air alive with expectancy. And then the long, almost unending wait until Christmas, when miraculously St. Nick generally delivers even a little more than was desired. This is why we have faith in him. That's the spirit of Christmas!

Now, we don't say our Field Engineers will arrive in sleighs filled with toys, but this we can guarantee: if you write a letter to LINCOLN, the Field Engineer who calls will be able to give you a good deal more help than you expected. Not only does he know welding products but also the best procedure to use on each job. He understands how to relate welding profitably to your total manufacturing operation.

That's why so many companies who have had faith in LINCOLN for over fifty years say, "It's a good idea to do business with LINCOLN where arc welding is a specialty and cost reduction comes to you as a 'plus' at no charge."

Merry Christmas!

THE LINCOLN ELECTRIC COMPANY
Dept. 1860 • Cleveland 17, Ohio

LINCOLN WELDERS

FACTORY

IDEAS OF THE MONTH

By LEWIS K. URQUHART, Consulting Editor, FACTORY

(For more information, circle item numbers on Reader Service Card next to back cover)

One way to gain usable space is to make use of "air rights." And one of the better ways to connect mezzanine or balcony with main-floor operations is by permanent inclined belt conveyor. Folder *(Rapistan)* shows typical installations that speed inter-floor movement of materials. **(236)**

Be a Winter Winner is new booklet *(National Safety Council)* and a natural for safety-minded managers who want employees to know the hazards of winter driving—and to drive safely in spite of them. **(237)**

Press-at-any-point operation makes Controflex the answer for machine and conveyor controls. It's a continuous strip switch *(Tapeswitch)* sheathed in Geon vinyl. Goes around corners. Shears to any length. **(238)**

Heard about silhouette-chart technique *(Automatic Electric)* for comparing series of graphs? To study related manufacturing activities, for example, production control charts are cut out in silhouette, arranged in slots on wooden block. Result: 3-D picture of production progress and delays, with each unit standing out in relief, for quick comparisons. **(239)**

Your best cost-reduction target today may be indirect labor. And new 12-step approach *(Ramond)* may be one for you. It's neatly outlined in 4-page folder which is yours for circling. **(240)**

No electric shocks with Safe-T-Drill *(Millers Falls)*. Reason: insulated chuck spindle, nylon housing. Even if motor breaks down, user is safe. Drill is 20% lighter than comparable aluminum drills, can be turned in seconds into circular saw, saber saw, finish sander, hedge trimmer. **(241)**

Screw Descriptor *(Active)* is for your maintenance storeroom. Twist dials for correct nomenclature to order heads, threads, washers. **(242)**

With spring only four or five months away, and your groundskeeper hollering for a new lawn mower, why not look at near-silent Lectro *(West Point)*? It's battery-powered, mows 15,000 sq. ft. or so on one charge. Choose 18-in. hand-propelled rotary or 21-in. self-propelled model. **(243)**

Did you know you could rent lighting equipment for low monthly payments? Sure can. With new lease plan *(Westinghouse)* payments can be made from funds earmarked for operating costs instead of for capital investments. **(244)**

Right-angle tube clamps *(Hunter Spring)* have serrated jaws that hold two pipes of different diameters at right angles to each other. Only one manual adjustment is needed. You'll think of a dozen applications. **(245)**

Gepac is low-cost automatic programer-comparator *(General Electric)* for checking operational readiness of electronic equipment. Completely transistorized. Portable (19½ x20x17 in.). Weight, about 60 lb. **(246)**

World's fastest nailer (up to 120 per minute) is how maker *(United Shoe)* is billing new single-blow 8-penny gun. Weighs only 9 lb. Covers area of 12-ft. radius from wheel-mounted hopper. Drives nails vertically, horizontally, upside down, at any angle. Consumes 20 cfm. at top speed. **(247)**

Booklet of the Month is 32-page Torque Manual *(P. A. Sturtevant)* that will refresh your memory on torque wrenches—and possibly implant a new idea or two *re* use and care, adapters, attachments, extensions, etc. **(248)**

Acres of floor to scrub? One answer is gasoline-powered Scrubmobile *(Lincoln)* which scrubs 6-ft. path at rate of 3½ mph. She holds a ton of fresh water. Washes, picks up scrub water (stores it in separate 210-gal. tank), vacuum-dries floor in single automatic operation. **(249)**

If you want to know more about sound-absorptive, sound-isolating, special acoustical materials, new catalog *(Hansson)* is good bet. **(250)**

No more flat tires—if fork trucks are equipped with "armor-plated" pneumatics *(Goodrich)*. Two plies of steel cables imbedded in rubber beneath tread make tires invulnerable to darn near all puncturing objects. And they'll wear five or six times as long as standard tires. **(251)**

Thing we like about Flor-Line paint marker *(Consolidated)* is thin side wheel for marking as close as ⅜ in. to walls, machines, stock. Also, retractable front guide wheel permits operation right up to a barrier. **(252)**

Now you can bombard dust particles, break them down to 0.1 micron size (dust that never settles), with electronic unit *(Statronic)* that can be added to new or old air-conditioning systems. Unit charges particles negatively so they are repelled from ceilings, walls. Result: lower maintenance costs. And they say negatively ionized air is exhilarating, healthful. **(253)**

Corrosion computer *(Harper)* is handy-dandy chart that tells in seconds how each of 8 types of metal withstands corrosive effects of 141 chemical agents. For free, of course. **(254)**

Reprints, anyone? *They Work Production Wonders* is just one of more than 100 helpful FACTORY articles available in reprint form at nominal cost. For complete list, circle this number on Reader Service Card: **(255)**

Turn the page

NEW ALL-PURPOSE extinguishers

Now... U.L. and F.M. approved for all classes of fires!

Now you can safely, effectively fight all classes of fire—A, B and C—with a single type of extinguisher! These revolutionary new ALL-PURPOSE Dry Chemical Extinguishers carry *high* Underwriters' Laboratories "ABC" ratings . . . are also approved by Factory Mutual. They provide the most powerful three-in-one fire protection ever offered in a single extinguisher! The 30 lb. model (U.L. rating 4-A, 20-B, C) packs fire-killing power equal to *two* Soda Acid extinguishers (rated 2-A) plus *one* conventional Dry Chemical extinguisher (rated 20-B, C)!

All-Purpose ABC rated extinguishers expel a new patented "Formula S" powder* which reacts chemically upon contact with all classes of fire. Powder is transformed into a strong fire-retardant coating that virtually eliminates re-flash in deep-seated wood and other Class A fires, including rubber! Free-flowing, non-toxic, non-abrasive "Formula S" is equally effective on burning liquids (Class B) and electrical fires (Class C).

Three-In-One Fire Protection

Smothers Class A fires with an insulating cover . . . prevents re-ignition or flashback!
Smothers and cools Class B flammable liquid fires!
Smothers Class C electrical fires . . . will not conduct electricity!

Available in 20 and 30 lb. sizes, featuring easy squeeze-grip operation . . . no annual recharge. Order today from your distributor! Look in the Yellow Pages under "Fire Protection Equipment." Or write to The Fyr-Fyter Company, Dayton 1, Ohio.

BUFFALO better-built

products of THE FYR-FYTER COMPANY

*Monoammoniumphosphate treated with a silicon resin.

Branches: Atlanta, Baltimore, Boston, Chicago, Dallas, Dayton, Detroit, Los Angeles, New York, Newark, Philadelphia, Pittsburgh, Portland, Rochester, San Francisco, Toronto (Ontario). Representatives and Distributors in all principal cities.

For more facts Circle 449 on Reader Service Card

Heard about Manufacturers' Exchange Corp.? New service provides practical way to (1) dispose of inventory you don't need, (2) procure items you *do* need from somebody else's surplus inventories. **(256)**

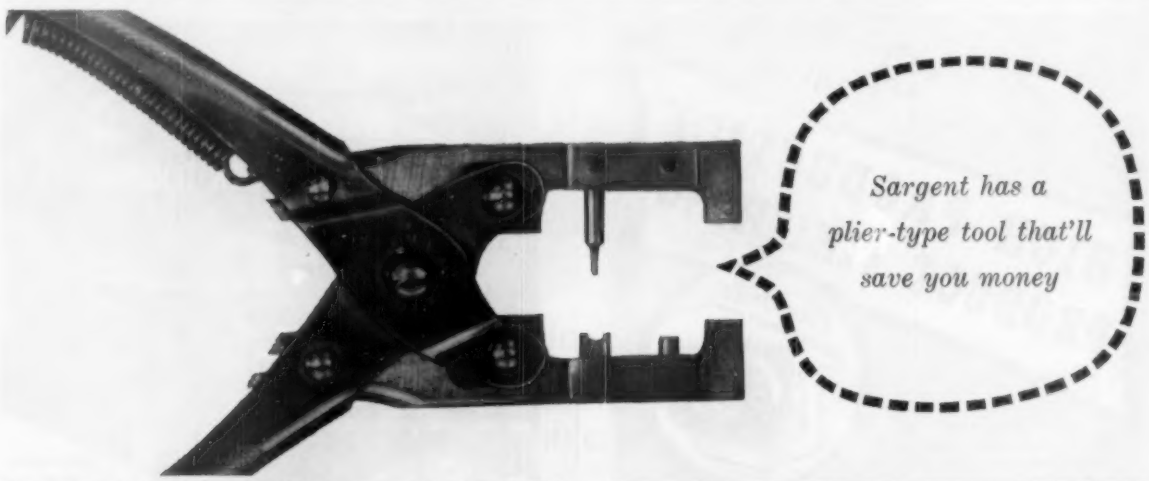
Suggested Christmas gift for pipefitter(s) in your maintenance department: Sury Universal Marker *(Boyd Bros. & Sullivan)*. Nothing like it for marking curved or flat surfaces where pipe must join or intersect. Sure way to get exact fit. Just set size of cut and joining angle—and draw. **(257)**

To dig old packing from stuffing boxes, two all-steel tools *(Flex-rock)*. One's rigid, t'other's flexible (two spiral shafts, one inside other and wound in opposite directions), for digging hard-to-get-at places. **(258)**

Nylon shock absorber *(Rose)* makes safety lines safer by absorbing sudden jolt in fall. It's 10 in. long when coiled, stretches up to 50 in. **(259)**

Pipe Fitters Manual *(Tube Turns)* is pocket-size for use in field. Text, tables, illustrations supply mathematical, physical, chemical, metallurgical data plus related design, layout, mechanical information. **(260)**

Turn the page



Every Sargent tool is tailor-made for **one** particular job. This means top performance . . . saving you time and money far beyond that of an ordinary "all purpose" tool.

If there isn't a Sargent tool that'll handle your job, we will make a "special" for you. Because of Sargent's unique component part construction "specials" are easily designed to fit your specifications.

SARGENT
hand tool division

SARGENT & COMPANY, New Haven 9, Conn. **22M**

Please send Sargent's Hand Tool Manual containing industrial application data for plier-type tools and selected case histories.

Name_____ Title_____

Company_____

Street_____

City_____ Zone____ State_____

Sargent plier-type tools cut • strip • punch • bend • twist • form • straighten • pull • push • insert • extract • press • crimp • squeeze • set • rivet • and spread

Papoose is 3-way portable vacuum *(Advance)*. Strap on back to clean overhead fixtures, work in confined areas. Mount on wheels to clean floors. Hang on wall to use at workbench or assembly table. **(261)**

Teaching electronics in your plant? Don't overlook new Dynamic Demonstrator *(Transvision Electronics)*. It's 3x5-ft. breadboard that can be assembled in classroom circuit by circuit. Training package includes teacher's manual that saves many weary hours of preparation time. **(262)**

Safe chain *(Kayto)* protects men working off ground from falls, guards against falling tools and equipment. Fastens in 5 seconds. **(263)**

Nice thing about new staple-type gun *(Auto-Tak)*: It not only inserts round 3-pronged tacks into bulletin boards or other flat surfaces, but also removes and stores them for re-use. Beats thumbtacking all hollow. **(264)**

Moving to the country? Where 37% of all fires are started by lightning? Better get free copy of "Lightning Facts and Figures" *(Lightning Protection Institute)*, read up on what's what, and what you can do. **(265)**

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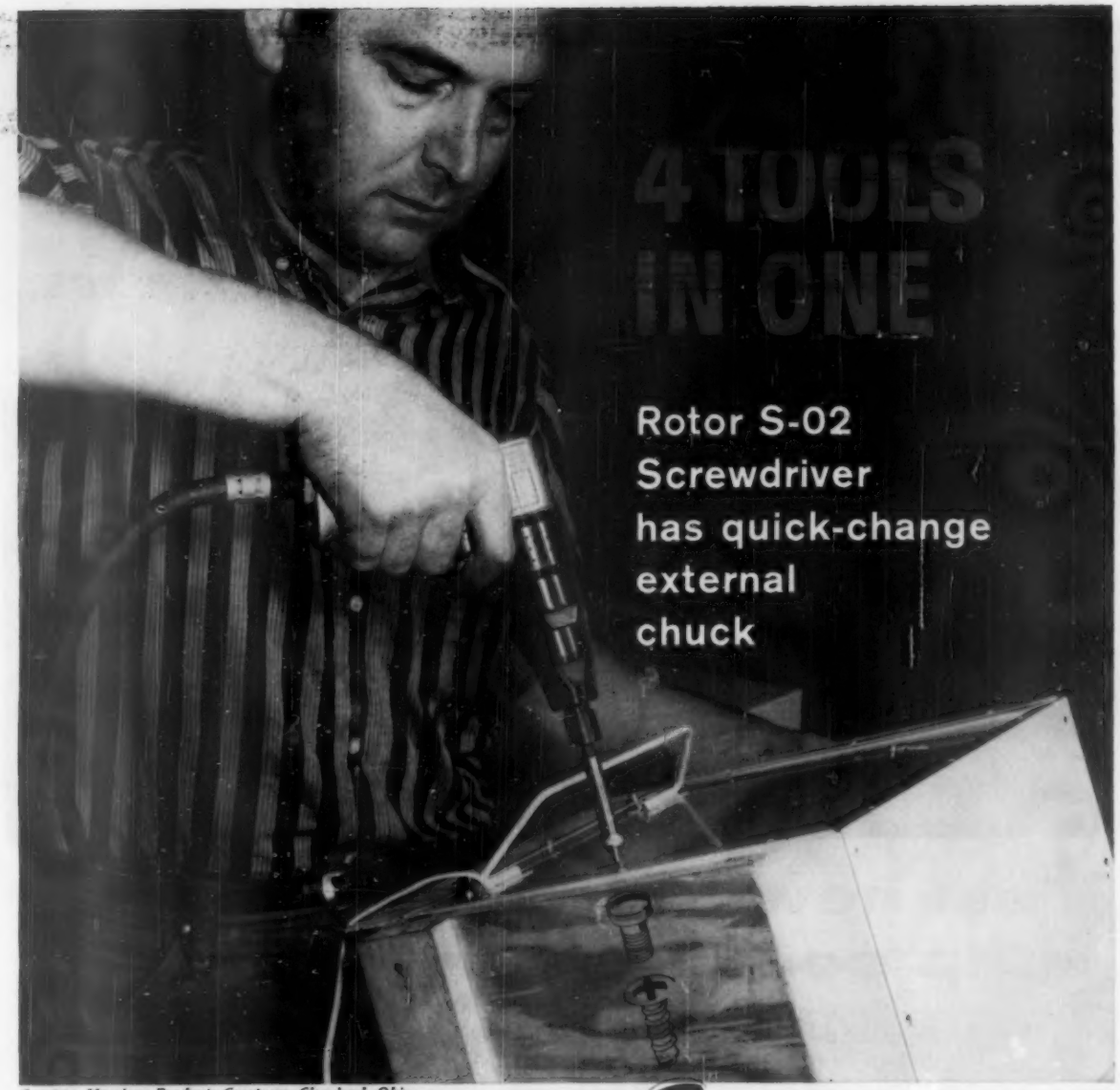


Courtesy Morrison Products Company, Cleveland, Ohio

JOB: Assembly of portable room air purifier—driving screws, bolts and nuts. Would normally require four different tools.

RESULTS: The *right tool for the job* here is the Rotor S-02PP Screwdriver with ¼" external chuck. At *one-fourth the tooling cost* this 900 rpm air tool gives quick change from any type screw heads—to bolts—to nuts. Operator just snaps in the right drive accessory to fit the job. All work is done at one station. Saves handling time. Cuts operator fatigue.

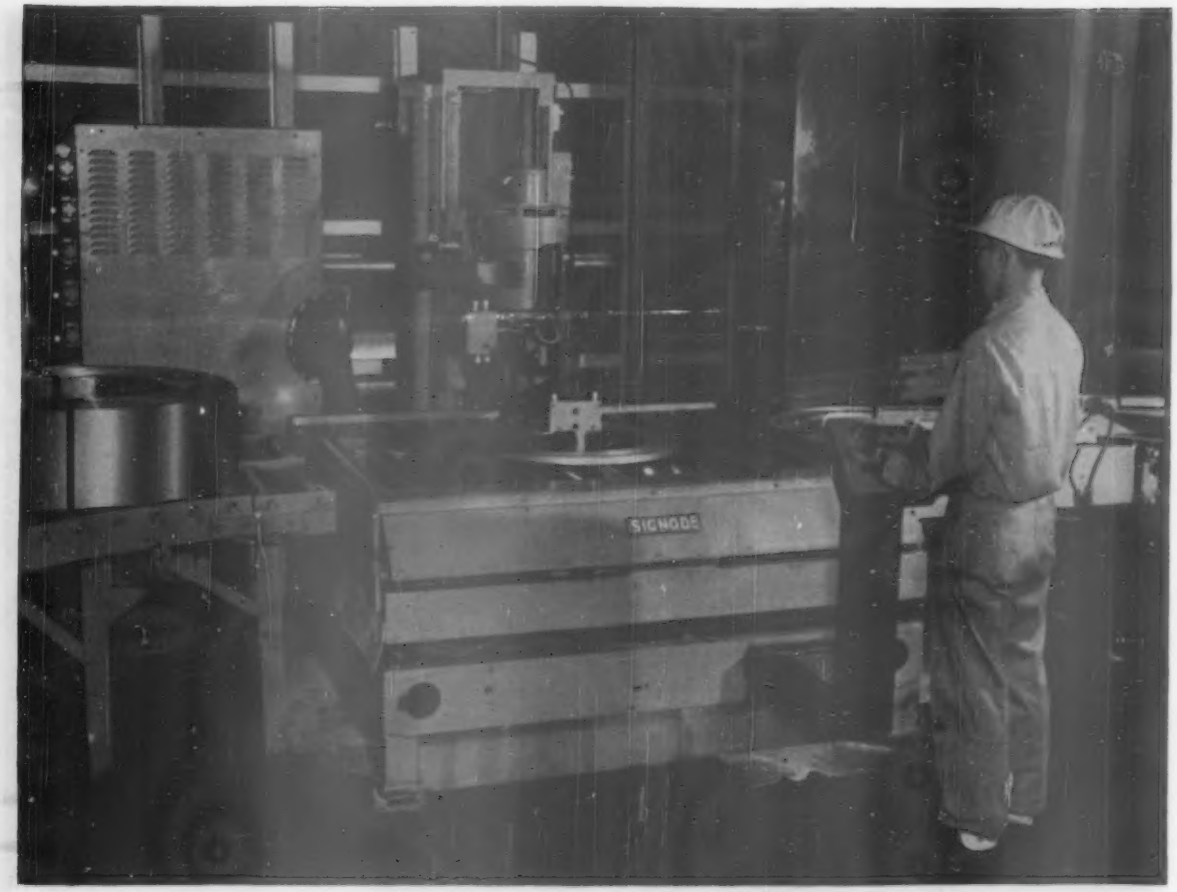
Ask for a demonstration of Rotor portable tools to see how they can cut *your* costs.

Write for full-line Bulletin 53-C.

ROTOR TOOLS

The Rotor Tool Company · Cleveland, Ohio
SUBSIDIARY OF THE COOPER BESSEMER CORPORATION

ROTOR AIR TOOLS: Assembly Tools • Drills • Small Wheel Grinders • Straight Grinders • Vertical Grinders • Scalers Chippers • Rammers • Special Tools • Air Motors • ROTOR HIGH-CYCLE ELECTRIC TOOLS: Grinders • Polishers • Sanders



Fast new Signode M20 strip coil strapping machine

Push a button, and this Signode M20 feeds the strapping through the eye of the coil and tensions, seals, and severs it—all in a few seconds. Push another button, and the machine rotates the coil for the next strap. The operator can apply two, three, four or more straps per coil.

Mixed coil sizes are strapped at volume production speeds. The machine automatically adjusts for any coil height (width of strip) between ½ inch and 14 inches, and for any coil O.D. from 19 inches to 50 inches. Each strap is applied with the same pre-set tension. As on all M20's, tension is easy to adjust if desired.

The machine puts the seal on the upper face of the coil. There are several advantages to this: working parts last longer because they are subject to minimum dirt and grit, accessibility for servicing is excellent, the seal is in plain sight.

A wide range of M20's is available on a deposit or annual rental basis, for strapping products of almost any shape and size up to six feet in diameter, using strapping from ⅜ to ¾ inches wide.

Write for details, including free booklet, "Signode M20 Series Standard Power Strapping Machines."

SIGNODE

First in steel strapping

SIGNODE STEEL STRAPPING CO.

2663 N. Western Avenue, Chicago 47, Illinois

Offices Coast to Coast. Foreign Subsidiaries and Distributors World-Wide
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FACTORY

FACTORY

PLANT OPERATIONS CASE BOOK

THREE-WAY MOTION Tumblers shake, rotate, revolve while deburring at Winchester . . . page 143

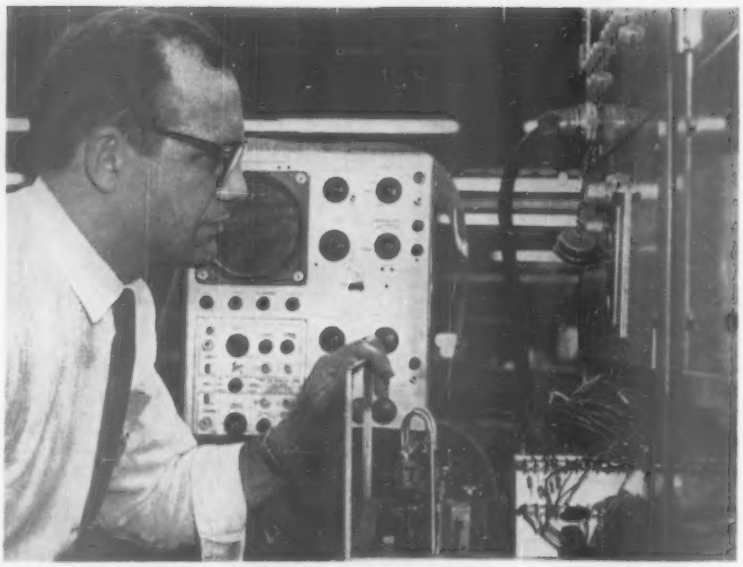
TABLE OF CONTENTS FOR THIS SECTION ON NEXT PAGE ►

FACTORY
CASE BOOK

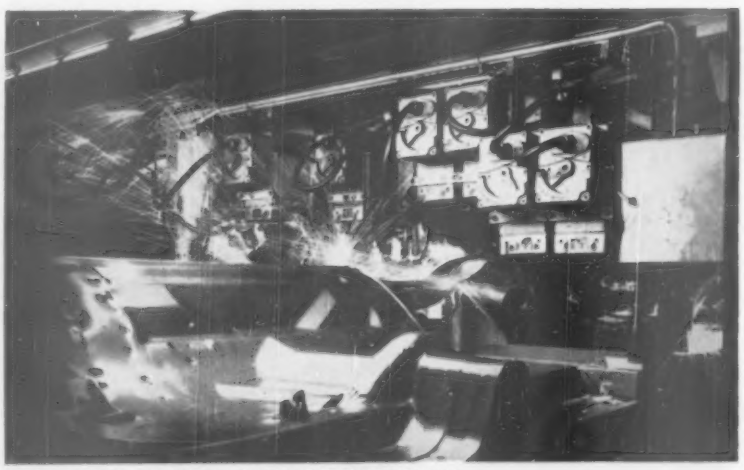
NORMAN H. SOLON, EDITOR

No. 38 December 1960

Robot traffic cop assures quality 140
Home-made cart eases handling 141
Electronic chairman demands politeness 141
Electroshaping unit dissolves metal 141
Cinemascope TV measures steel 141
Storage on wheels 142
Screwdriver handles square set screws 142
Mobile thermocouples tell a hot story 142
Giving the boot to indoor rain 142
Stands on one foot 142
Three ideas—all geared to production efficiency 143
The hidden skeletons 144
Switch shrugs off heat and humidity 144
Hi-frequency welds form copper tubes 144
Floating floors 145
Weighing by gravity 145
Which way—rectifier or motor generator? 145
Case Book capsules 145
Three-lane conveyors are KP's delight 146
Circuit breakers keep power on 146
Peeping Tom bags for all sizes 146
Electrostatic touch-up slashes paint bills 146
Rolling charmwomen scrub plant down 148
Pacifist rat-trap cleans, not kills 148
A safe place to park 148
It really pays to work safely 148
3-D charts stand out 149
Robot timer works by phone 149
Crane scale solves weighty handling problem 150
Restless x-ray allows fast set-up 150
Plastic gives dirt the heave-ho .. 150



THIS ELECTRONIC SCANNER CONTROLS . . .



FIRING OF PLANT'S 24 WELDING UNITS

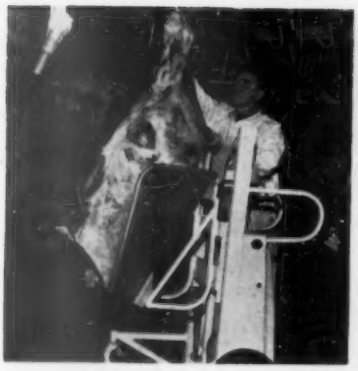
Robot traffic cop assures quality

Twenty-four welding units with a combined electrical appetite of 45,000 kw. are in operation at Chrysler Corporation's Twinsburg, Ohio, plant. Yet there is no danger of two units firing at once and spoiling the quality of the weld. The entire operation is controlled by a plant-devised electronic scanner.

The electronic traffic cop scans the 24 welding units 320 times a second, and sequence-fires each unit. If two welders fire simultaneously, the consequent voltage drop may affect weld quality.

If a given welding machine fails to fire within a three-second interval, the scanner turns on a red warning light to alert the maintenance crew. Then it moves on to fire the next unit in line. If repairs can't be made in a few minutes, the entire operation can be switched to another assembly line, still controlled by the scanner.

The scanner assures that each welding machine receives an identical amount of electrical energy, thereby keeping weld quality constant. If the scanner should blow a tube or go out of commission, there's an identical standby machine at hand.



Home-made cart eases handling

This plant-made cart has relieved aching muscles at Armour Company, Chicago. The rubber-tired device is used for loading and unloading beef from overhead hooks. It's easily moved by one operator. Large rear wheels allow tilting.

For loading, a hydraulic lift raises the cart to the level of the hook. For unloading, the beef is lowered onto the cart by a "dropper" attached to the dock beef rail (photo).

Electroshaping unit dissolves metal

The hardest metal can be quickly formed or cut to almost any shape by a new electrolytic machining process at Steel Improvement and Forge Company, Cleveland. The excess metal is actually dissolved away. Hardness of the metal is not a factor in the operation.

Here's how it works: The work piece is placed next to a shaped electrode (the mirror image of the finished piece). Electrolyte is pumped into the space between the electrode and the work piece. As the electric current forms metal to the desired shape, the electrode closes on the work piece. In the photo a heavy carbide bar is being cut.

A rough-forged jet turbine blade can be machined to a 0.003-in. tolerance in five to ten minutes under this system. The job used to take one to two hours of grinding. The electrolytic unit can also be used to drill round and irregularly shaped holes in extremely hard alloys that could not be penetrated with conventional drills.

Because there's no pressure on the work piece, thin sections can be shaped without deformation. And the shaping process produces no metallurgical change on the work-piece surface.

The system was devised by the company and Battelle Memorial Institute, Columbus, Ohio.

Electronic chairman demands politeness

Does your conference room sometimes resemble the traditional smoke-filled room at a national political conference—with everybody talking at once, nobody listening? This problem has been at least partially solved for executives at Forest Oil Corporation, Bradford, Pa.

A speakerphone system with a built-in politeness circuit aids communication between speakers and conferees using a common mike in large conference rooms. And it permits executives at remote points to speak to the conference room by telephone. It prevents interruption of the speaker in the conference room or of the executive at a distance. The system also keeps the conference speaker from interrupting conferees as they make their points.

The speakerphone (Bell Telephone Company of Pennsylvania, Pittsburgh) has a built-in "transmit and receive lockout," which is switched over a few seconds after talker is finished. This delay takes care of normal speaking pauses.

CINEMASCOPE TV MEASURES STEEL

All the comforts of a plush theater are the shearman's lot at Bethlehem Steel Company's Bethlehem, Pa., mill. From an air-conditioned pulpit, he checks a wide TV screen that accurately measures a moving bloom of red hot steel as it passes through a downcut shear. This allows him to cut the bloom in 12- to 36-ft. lengths at ⅛-in. tolerances (previously tolerances had been a matter of inches). The screen has an easily read scale superimposed on the televised steel section. In most plants, blooms are measured by an operator standing 10 feet away and reading weld marks on the side of the roller bed. Bethlehem's system is manufactured by Grison Color, Inc., Binghamton, N.Y.

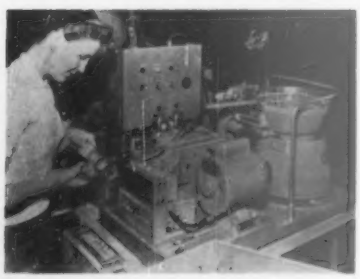
Storage on wheels

These wooden storage racks on wheels have solved a waste problem at Aeronca Manufacturing Corporation's Middletown, Ohio, plant.

In the past aluminum sheets were tossed into the scrap bin after the punching operation. Even though some sheets were large enough to salvage, there was no place to store them.

The plant-made storage rack proved to be the answer. It's placed in the center of the punching department. When a piece of aluminum is large enough to salvage, it's just as easy to place it in the rack as to toss it out.

The photo shows a typical day's collection of re-usable metal that formerly would have been junked.



Screwdriver handles square set screws

This mechanical screwdriver assembles square set screws into pipe fittings fast at Hollaender Manufacturing Company, Cincinnati. Normally, this operation tends to create a production bottleneck. Square set screws (their lengths same as diameters) are always a tough proposition to orient properly for automatic insertion.

This machine (Standard Pressed Steel Company, Jenkintown, Pa.) licked the problem. It now has an insertion rate of 750 to 1200 screws per hour—with hand feeding. When Hollaender installs automatic feeding in the near future, the rate will be 2500 screws an hour.

In the photo an operator is holding the pipe fitting on the positioning arms while the square set screw—fed from the hopper at the top right—is inserted.

Use of the machine saved $1500 in the first year. And it has speeded up shipments 30%.

Mobile thermocouples tell a hot story

Sure, you know the temperatures of the kilns and ovens in your plant. But just how meaningful are these figures? Do you know the actual shelf temperatures of cars passing through? Stackpole Carbon Company, St. Marys, Pa., has found the answers. Here's the procedure the company now follows:

Three thermocouples in protective tubes are mounted on a car that's fully loaded with a representative load of ceramic products needing high-temperature firing. This car is sent through the kiln at periodic intervals.

Result: a constant record of the temperature profile along the entire length of the kiln. By studying these profiles the operator can adjust kiln-heating rates or change car-loading techniques as needed to obtain optimum firing.

The trailing thermocouple leads run from the car to the charging end of a recorder (Leeds and Northrup Company, Philadelphia). A slack cable is coiled loosely around a plant-made steel drum fixture installed a few inches above the floor. As the car moves through the 2500 F., 100-ft.-long kiln, the leads drag along a steel trough between the car rails. The leads are protected from the heat by a ⅜-in. tube of asbestos Teflon material.

Payoff: No more guesswork about kiln heating, thus greater consistency in quality of product.

Giving the boot to indoor rain

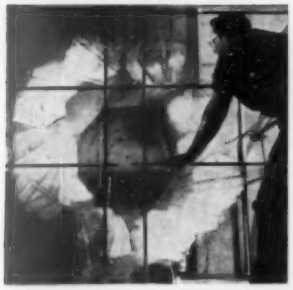
Condensation was a problem at Albert Reed & Company, Ltd., Blackburn, England. It caused water to drip from the paper mill's structural concrete pillars, tie beams, and concrete roof trusses. It also raised the moisture content of the air. This meant discomfort to workers and a threat to product quality. A multiple coating of Seculate compound (Chemical Concentrate Company, Fort Washington, Pa.) finally solved the problem.

First, a sealer was sprayed on to provide an impervious film between compound and surface. This was followed by three coats of compound—also applied by spraying. Result: elimination of moisture droplets and the threat of corrosion.

Stands on one foot

This one-piece stand (left) used for electric motor storage has cut costs by $10,000 annually at Reliance Electric and Engineering Company, Cleveland. But it hasn't sacrificed strength or appearance. The plant-made modified bent-type design replaces two- and three-piece weldments, which required extensive fabricating, fit-up, and welding.

Cover story



Three ideas— all geared to production efficiency

Adapting a production line for a new product is a headache at best in any plant. Winchester Division (New Haven, Conn.) of Olin Mathieson Corporation was faced with this problem when it started manufacturing the Army's new M-14 rifle. Here are three ways in which the company smoothed over the difficult production transition period:

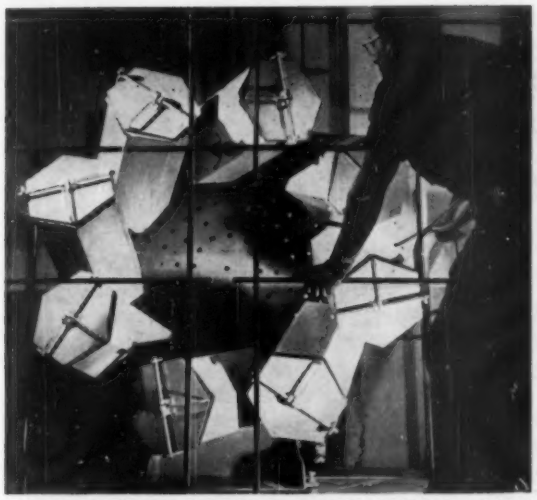
1. Shakes, rattles and rolls. These tumblers are positioned on a rotating board to gain three-way motion. They shake, rotate, and revolve while deburring gun receivers. And they can move at 28 different speeds. The tumblers are made by BMC Manufacturing Corporation, Binghamton, N. Y. They're accident-proof—they can't start until the barrier gate surrounding them is closed. Under the old system, the parts were manually filed.

2. Five in one. Just one glance gives an accurate measurement for five different tolerances with this instrument (Sheffield Corporation, Dayton, Ohio). In other cases, as many as nine gauges can be measured in one operation. The product is held in a jig made by American Can Company, Inc., Bloomfield, Conn.

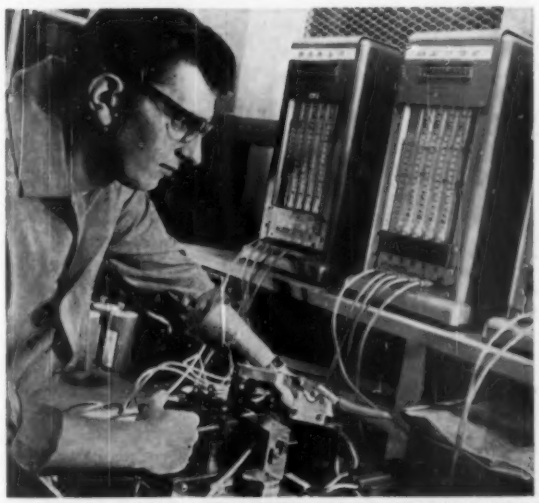
This has eliminated the bottleneck created by the need for individual measurement.

3. Easing small parts handling. A "zillion" of these metal trays make it a cinch to transport small parts. They're specially fitted with small pipe compartments for each part. Perforations at the bottom allow oil and other liquids to drain out. This eliminates the risk of rust present in the use of solid wooden and metal trays. The metal trays also make storage easy. They can be placed one on top of the other without the danger of counterbalancing by means of interlocking handles.

The company designed the bins and contracted the manufacturing operations to several firms.



1. MULTI-SPEED TUMBLER MOVES THREE WAYS.



2. ONE GLANCE MEASURES FIVE TOLERANCES.

3. THOUSANDS OF BINS EASE PARTS HANDLING.

YOU BE THE ARBITRATOR

THE CASE OF

The hidden skeletons

Out of the experience of the American Arbitration Association

A machine shop doing work for the Defense Department arranged to get about 100 of its employees cleared for secret work. The investigation disclosed that two employees had criminal records which they had concealed when applying for their jobs. Dick B. had paid a fine for being in possession of stolen goods; Dennis S. had been jailed for drunken brawling.

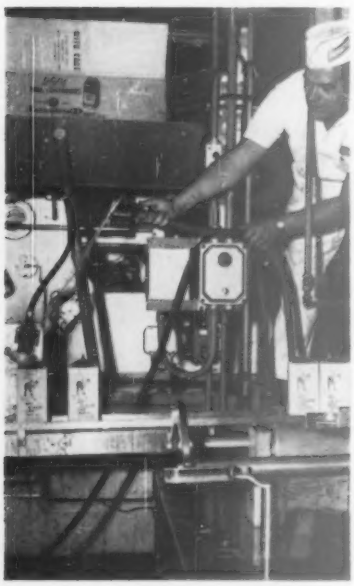
The plant manager confronted the two men with the disclosures, reminded them that discharge for falsification of job applications was strictly enforced. He advised them to quit "voluntarily" so as not to hurt their chances of getting other jobs. The men accepted this way out.

But things got busy in the shop and the company decided they could use the skills of these two men in a "non-sensitive" department. So it promptly re-hired them as new employees.

The union then filed a grievance. "The net effect of this has been to deprive men of their seniority for disciplinary reasons," argued the steward. "That's not a proper form of discipline." Management replied that discipline was not involved. The men had quit their jobs and now they were coming back as new workers.

Eventually the case went to arbitration. Suppose you were the arbitrator? How would you rule?

For the actual decision turn to page 150



Switch shrugs off heat and humidity

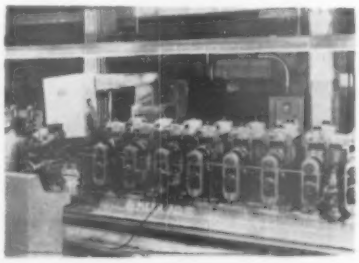
Soaring temperatures and high humidity were playing havoc with waterproof switches at Fairmont Dairy, Minneapolis. Internal condensation caused these devices for counting milk cartons to fail after only a few days' use. This meant replacement costs were sky-high.

Proximity switches (Minneapolis-Honeywell Regulator Company, Minneapolis) have finally eliminated the replacement problem. Heart of the system is a proximity-switch sensor, which detects metal parts moving close to it.

Since the device has no moving parts, it can be completely sealed. This permits use in exceedingly damp atmospheres. Even regular hosings with steam and hot water won't affect its accuracy.

The cartons bump a mounted sheet-metal flapper near the sensor. Each time the flapper swings, the sensor trips a remote counter.

Speed is no problem—the switch can count up to 700 items per minute; the conveyor speed is only 25 to 78 cartons per minute.



Hi-frequency welds form copper tubes

Copper tubing is being produced from cold strip copper fast and economically at Tubotron, Inc. (Newark, N. J.), affiliate of Eastern Rolling Mills, New York. Welding at radio frequencies—a new technique—is the secret of the process. Previous method: extrusion.

The new machine (Mannesmann-Meer Company, Dusseldorf, Germany) has a RF power capacity of 140 kv. It can form tubing with outside diameters of from ½ to 3½ inches, with wall thicknesses ranging from 0.017 to 0.140 inch. Here's how the operation works:

The metal strip passes through a series of rolls that form it into an almost complete circle. The edge faces of the rounded strip come into direct contact with the two electrodes of the high-frequency power source. The current follows a V-path along the edge faces, flowing from an electrode on one side of the strip to the weld point where the tubing surfaces join. It then flows on the opposite metal face to the other electrode.

The current heats the open faces of the strip to a plastic state by concentrating the 450-kc. power in a small area along the surface of the metal. The current never travels more than 0.0007 of an inch below the surface. This means extremely fast heating. For example, when the production line is running at 300

feet per minute, the cold strip is heated to 1700 F. in just 1/100 of a second—ready for welding.

The machine also performs scarfing and finishing operations.

With this process Tubotron can make tubing at much closer tolerances than it did by extrusion. Brass and exotic alloys can be welded in the same manner.

Floating floors

Here's a way to get at wires and cables in your computer room fast. It's done with floating floors. They are being used at the First National City Bank Building, New York. The floor panels are raised above the subflooring on steel pedestals, anchored with rubber-based adhesives (Miracle Adhesives Corporation, Bellmore, N. Y.).

A conventional suction cup tool can remove any of the vinyl-covered aluminum plates instantly. This means that inspection or repairs to the lines below can be made whenever necessary without ripping up the floor.

The system was designed by Floating Floors, Inc., New York.

Weighing by gravity

A system for continuously measuring liquids and emulsions by gravity has been devised by Weighing and Controls, Inc., Hatboro, Pa.

A flexible mounted pneumatic weight transmitter, coupled with a specially designed steel tank, continuously weighs a constant volume of liquid. Since the weight of the constant volume is directly proportional to the specific gravity of the material, readout is directly in specific gravity units.

The system is accurate to ¼ of 1% and maintenance is negligible.

Which way—rectifier or motor generator?

Here's how silicon and selenium semi-conductor rectifiers stack up against motor generators as d-c power sources, according to E. J. Laughlin of Westinghouse Electric Corporation's Buffalo, N. Y., plant. He rated the two power sources on 15 characteristics at a recent material-handling conference. The ratings are in the form of numbers one through three—the lower numeral being the higher rating.

Though the ratings cover factors of most interest to crane users, they are valid for many a-c to d-c conversion requirements.

Characteristics	Semiconductor rectifiers		Motor generators
	Silicon	Selenium	
1. Floor space	1	2	3
2. Net weight	1	2	3
3. Efficiency	1	2	3
4. No load losses	1	2	3
5. Power factor	1	1	3
6. Regulation	2	3	1
7. Overload capacity	3	2	1
8. A-C line disturbance on starting	1	1	3
9. Change in output starting cold to normal operating temperature	1	1	3
10. Ease to d-c voltage adjustment	2	2	1
11. Ease to parallel operation	1	1	3
12. Cost of installation	1	1	3
13. Maintenance expense	1	2	3
14. Original cost (capital investment)	1	2	3
15. Ability to absorb regenerative loads	2	2	1

CASE BOOK CAPSULES

Electrostatic printer tubes that can translate electronic signals into printed words at speeds of up to 20,000 characters per second have been developed by Raytheon Co., Waltham, Mass.

Plantation rubber is used in only 42% of total rubber products being produced in the U. S., according to Goodyear Tire & Rubber Co., Akron, Ohio. Synthetic rubber accounts for the remainder.

The 1961 International Industrial Conference, a meeting of business and industrial leaders from the free world, will be held in San Francisco next September.

Pipelines of the future will carry solid materials of all kinds for long distances and at less cost than other forms of transportation. This is predicted by Charles C. Whittelsey, president, Ford, Bacon & Davis, Inc., New York.

A scrambler telephone device for industrial security has been developed by Delcon Corp., Palo Alto, Calif. It's portable and will guard against any eavesdropping on confidential conversations.

Steel that weighs only a quadrillion of an ounce (15 zeros) can now be studied by means of an electron probe micro-analyzer recently invented by Jones & Laughlin Steel Corp., Pittsburgh.

Traces of oxygen of less than one part per 3 million in inert gases can be accurately measured with an electrolytic analyzing device engineered by Thermco Instrument Corp., La Porte, Ind.

Portable self-raising gantry for loads weighing up to 30 tons is being marketed by Ontario Equipment, Inc., McCook, Ill. Two men can easily assemble the 5-ton unit in only 10 minutes.

A cadmium-plating process to further strengthen high-strength steel has been developed by Lockheed Aircraft Corp., Burbank, Calif.

Three-lane conveyors are KP's delight

This three-lane steel conveyor literally cleans up after itself at Center County Canning Corporation's Center Hall, Pa., plant. It's used as a moving work bench for cutting the eyes from potatoes.

Peeled potatoes are fed to the outer two lanes by means of a chute. After the eyes are removed, workers place the vegetable in the faster-moving center lane for transfer to the next operation. The specks fall into the side lanes as they're cut, and are carried to a waste receptacle.

The conveyor, driven by a variable speed motor, is made by Sandvik Steel, Inc., Fair Lawn, N. J.

Circuit breakers keep the power on

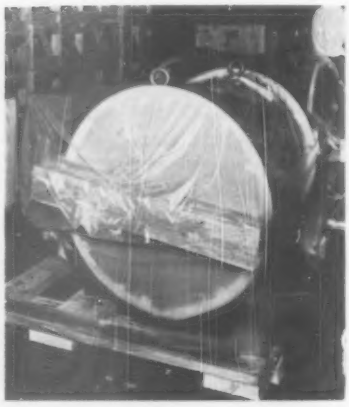
A power failure won't halt operations at New Jersey Bell Telephone Company's Wildwood installation.

Reason: Two incoming circuit breakers (I-T-E Circuit Breaker Company, Philadelphia) provide instant transfer from the normal utility power source to an emergency generator, without need for a separate transfer switch.

The installation receives incoming utility power, which passes through one of the two electrically and mechanically interlocked 800-amp. molded case circuit breakers. If normal power fails, the automatic transfer control system senses the loss and starts a 75-kw. diesel engine-generator. When generator voltage reaches the proper level, the normal breaker opens and the emergency breaker closes to restore power to the building.

When the normal power is restored, it immediately energizes a two-minute time-delay relay. When this relay closes, the emergency breaker opens and the normal breaker closes into the normal power source after a two-second time delay.

The breakers can be manually operated if the control battery voltage fails. A removable crank handle does the job.



Peeping Tom bags stretch way out

Just three sizes of polyethylene bags now provide complete protection for the entire range of crated motors shipped by Reliance Electric and Engineering Company, Cleveland. The bags also permit quick see-through identification of motors without removal.

It used to take six sizes of special waterproof bags to do the job, coupled with large amounts of wrapping paper for adequate protection of the motors.

The plastic bags save the company more than $1000 annually in material costs. And give better moisture protection to the motors during shipment and storage.

Reprints of the Plant Operations Case Book are available. Price 50¢. For quantity prices, write Reader Service Department, FACTORY, 330 W. 42nd St., New York 36.

Electrostatic

Electrostatic painting was proving a boon to Hampden Specialty Products Corporation (Easthampton, Mass.), subsidiary of The Hamilton-Skotch Corporation. It had cut paint usage considerably, at the same time speeding up the whole operation over the old hand-spraying system.

But the system (Ransbury Electrocoating Corporation, Indianapolis) had not eliminated the need for costly manual touch-ups. Since folding chairs are dotted with crevices, three men per shift were required to give the product a final coat.

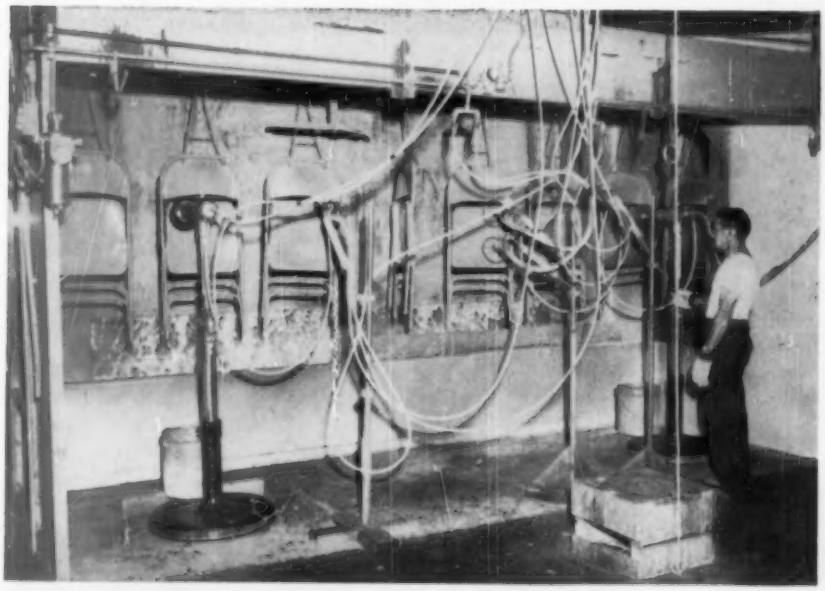
The answer lay in adapting the electrostatic system to a plant-designed mechanized touch-up booth. Chairs are now carried on an overhead conveyor to the electrostatic paint booth, to the touch-up booth, then to the oven.

Result: All three men who formerly did touch-up work were given other jobs, and there's not a hand-sprayer in the entire plant. The photos and the table at top of the facing page tell the story.

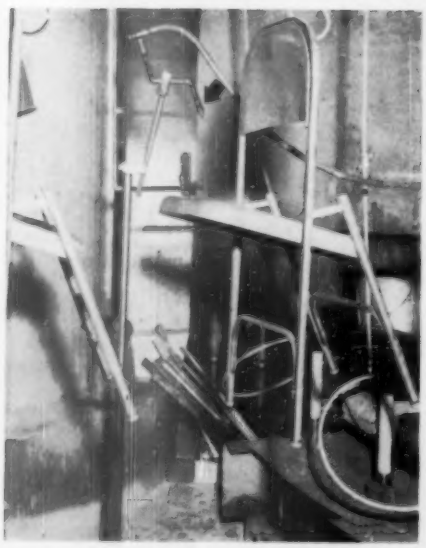
Trigger turns chair around when it reaches center of touch-up booth.

touch-up slashes paint bills

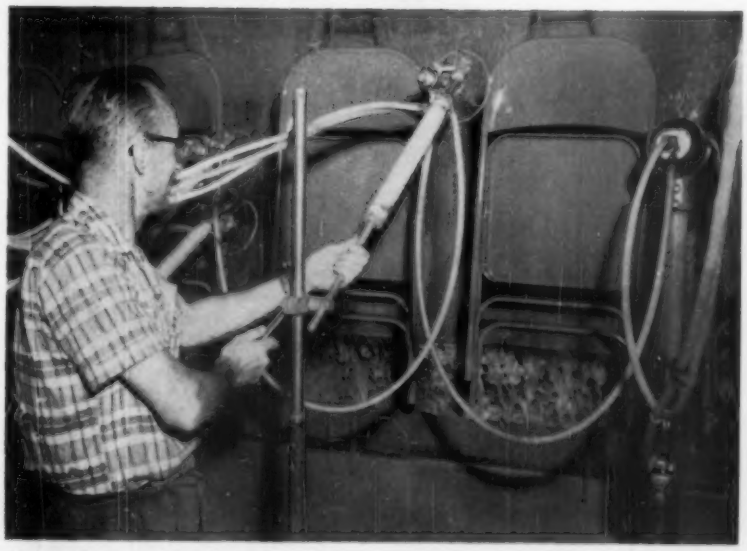
	Chairs per gallon of paint	Chairs painted per day
Hand-spraying system	11	1000
Electrostatic paint system with manual touch-up	56	2500-3000
Electrostatic touch-up	90	over 4000



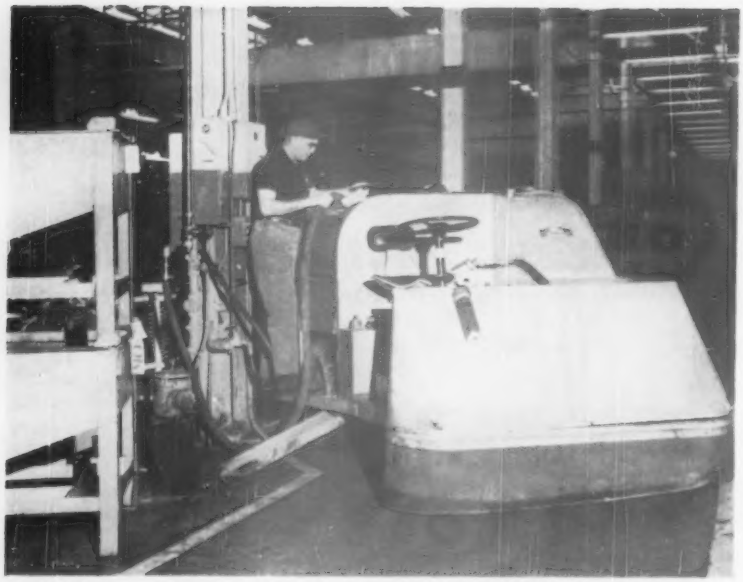
Four electrostatic bells and two modified air guns do the touch-up job. They're synchronized to spray only when a chair passes, thus cutting down paint costs. The bells receive a full charge from the regular electrostatic system. And a charged ring surrounds the nozzle of the air guns, narrowing the angle of spray. Both the bells and the guns are mounted on insulating poles that can be manually adjusted to any needed height. Downtime does not exceed three to five minutes when chairs of a different size come through. A trigger in the center of the booth turns the chairs around so the spray can reach both fronts and backs.



Air bath (arrow) cleans dust off chairs before they enter paint booth.



Twist of the wrist adjusts the air-gun mount to accommodate folding chairs of different heights at the touch-up booth. This keeps downtime to a minimum.



Rolling charwomen scrub plant

Cleaning is a cavalry function at General Motors Corporation's Grand Rapids, Mich., plant. This mechanical scrubber is the key to the housekeeping program in the 660,000-sq.-ft. factory area.

Main aisles are scrubbed down seven times a day—about five miles of cleaning in 24 hours. This is because precision equipment for jets could be thrown off by dust.

The scrubber vacuum machine (Finnell System, Inc., Elkhart, Ind.) dispenses a cleaning fluid, then scrubs the floors with four 18-in. brushes and up to 400 pounds of hydraulic pressure. Finally, it sucks up the dirty solution. Entire operation is done in one pass. When floors are especially dirty, the scrubbing operation is repeated. Only one operator is needed.

The cleaning solution is automatically mixed in special vats. These heat the solution and keep it at constant optimum temperature. Before this, janitors used to mix the solution, and they usually wasted chemicals in the process.

The hot solution is pumped to various housekeeping stations located strategically around the plant (photo). Fresh solution is then pumped into the scrubber at each station, and the dirty waste water is drained through a trough at the bottom of the truck. This water is piped to a central disposal unit for treatment before being dumped into a nearby creek.

Pacifist rat trap cleans, doesn't kill

A novel adaptation of a mousetrap has eliminated costly downtime for cold rolling mills at Armco Steel Corporation's Butler, Pa., plant.

When rolling coils of steel, the rolls pick up oxide, dust, and scale. These must be removed periodically to prevent surface defects in the steel. However, removal of the rolls for surface polishing means the mills have to be shut down for several hours each time.

The problem was solved with the use of emery paper fastened to a board with common mousetraps. Moving the board back and forth over the slowly revolving mill rolls makes cleaning just a matter of minutes. It's done like this:

Mill operators stop rolling steel and raise the upper roll several inches. Then they revolve both upper and lower rolls slowly while the emery board is pressed against each in turn.

A safe place to park

A parking space where you can avoid the tie-up at the whistle is at a premium at any large plant. There's one at Kaiser Aluminum & Chemical Corporation's Chalmette, La., plant. But it's not free.

It's given as the safety award of the month. The employee who qualifies is entitled to the parking space—just outside the main gate—for a whole month. Recently, a worker who travels to work in a bus qualified for the prize.

Result: Four parking spaces were allowed for the bus.

It really pays off to work safely

"Safety pays" is more than just a slogan at Metal & Thermit Corporation's Carteret, N. J., plant. It's a fact. Silver dollars are awarded monthly to employees on the basis

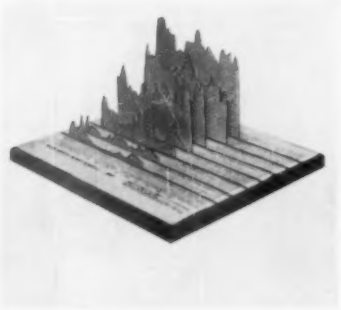
of the safety record of their respective groups.

There are 10 groups for the 215 employees, each headed by a group leader and a safety leader. Completion of a calendar month without a lost-time accident or doctor's case in a group entitles each member to two silver dollars. The group leader receives five and the safety leader gets four.

A doctor's case requiring no more than two visits cuts each group member's share to only one buck. With a lost-time accident, or three or more visits to the doctor, the group is shut out for the month.

There's one joker. To qualify, every employee must attend the monthly meeting of his group.

This 6-month incentive program will run through February.



3-D charts stand tall to tell the tale

Just a glance gives an over-all picture of production efficiency at Automatic Electric Company, Northlake, Ill. These 3-D production control charts tell the story.

In this photo, for example, management had an instant picture of the relationship of delays occurring in five different departments. The rear two graphs represent the original work load assigned for two of these departments. By comparing the first five charts with the last two, the reason for the delay was easily determined.

Formerly, each chart had to be examined individually and it was necessary to constantly refer back to get a comparison, wasting valuable minutes. The company later experimented with overlays, but the maze of crossed lines made it extremely difficult to read.

Robot timer works by phone

Timekeeping is time saving at National Electric Welding Machines Company, Bay City, Mich. A tape recording system sees to that. Here's how it operates:

When a production worker arrives in the morning, he picks up a special telephone and reports his clock and job numbers and the time. However, there's no one on the other end of the line. The one-way conversation is recorded on tape. Later, when he finishes his first job, the employee reports that fact, and gives details about his next assignment over the phone. Since he is talking to a robot, job data—not Mickey Mantle's batting average or last night's heavy date—make up the entire conversation. There's no time wasted in social chit-chat.

A timekeeper later plays back the tapes at his convenience, and then transfers the job data to the proper accounting sheet.

There are 15 telephones located at key points throughout the shop to serve 225 production workers. The phones are connected to a bank of three recorders ready to receive the data. A fourth unit is automatically activated whenever one of the others fails to operate. If one recorder is in use when a call comes in, it's routed to the second recorder. If that one is busy, it goes to the third.

A control console informs an operator at a glance on which shop telephones are in use. A call-back circuit can provide live two-way conversation when it's necessary to check any information.

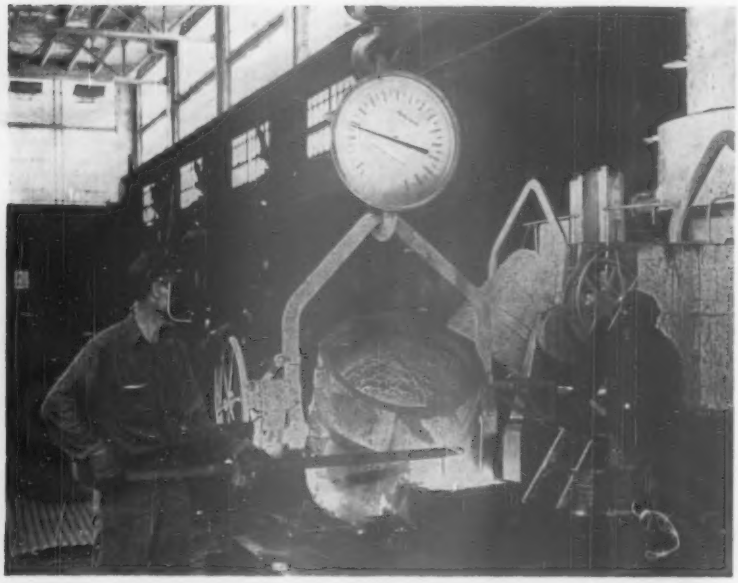
In the past, workers had to check in and out with the timekeeper four or five times a day. Minutes were wasted in walking to the timekeeper's bench. Other delays occurred in waiting in line to report, and in socializing between the workers and timekeepers. That's all eliminated by the new system.

Night shift personnel had to keep their own time records, which sometimes meant inaccuracies in reporting. Now they can use the phone-tape system.

The new system also eliminates the alternate periods of idleness and hectic activity in the timekeeper's job. It gives him a steady flow of work throughout his shift.

COMING NEXT MONTH

Three relatively inexpensive cost-cutting ideas have paid off for Lear Company. They are easily adaptable for plants of any size. All it takes is a bit of ingenuity.



CRANE SCALE SOLVES WEIGHTY HANDLING PROBLEM

This crane scale hollers "when" at Baker-Perkins, Inc., Saginaw, Mich. It makes sure that the correct amount of molten iron is poured into a mold. Made by Hydroway Scales, Inc., Madison Heights, Mich., the scale has a 15,000-lb. capacity. And it's marked in 25-lb. graduations. The measuring device, attached to the crane hook, eliminates the necessity of transporting products to a central weighing station, thus preventing the tie-up of valuable handling equipment.

Restless x-ray allows fast set-up

There's no wasted time in setting up an x-ray unit for quality control testing of welded seams at Colonial Iron Works Company, Cleveland. This plant-made elevator cart does the job fast and easily.

The company uses a portable 260-kv. x-ray unit (Westinghouse Electric Company, Pittsburgh) to check the seams of pressure vessels. Simply by cranking the rubber-tired cart, the x-ray machine can be raised or lowered to heights ranging from 2½ to 6 feet.

Although the unit is normally cooled by water during long exposures, Colonial engineers modified it for cooling by low-pressure air. This is for the sake of convenience, since there are air hose outlets located throughout the plant, but no water outlets and hoses.

The hose at the right of the photo feeds air to the unit.

Contributions from readers reporting experiences will be welcomed. No need for fancy writing; just a clear, concise statement of facts. If you have photos or drawings, be sure to include. We'll edit for the Case Book. Contributions accepted will be paid for at time of publication. Address: Case Book Editor, FACTORY, 330 West 42nd St., New York 36.

YOU BE THE ARBITRATOR

Continued from page 144

The award—The arbitrator emphasized that the issue before him was not whether the men had been discharged for just cause or had quit, since no grievance had been filed at that time. In either event, they had lost all their seniority. However, since the men were told at the time of re-hiring that they were coming in as new employees, there was no contract violation on the part of the employer.

Caution: The award in this case is not an indication of how other arbitrators might rule in apparently similar cases. Arbitrators do not follow precedents. Each case is decided on the basis of the particular history, contract, testimony, and other facts involved.

Plastic gives dirt the heave-ho

Job cards stay with the job all the way at John Oster Manufacturing Company's Milwaukee plant. They are protected against oil or grease smudges that in the past made 38% of the cards illegible before a job was complete. Plastic lamination has meant the difference between the top and bottom cards in the photo.

The laminating process is done with an electric copying machine (Minnesota Mining and Manufacturing Company, Minneapolis). Costs average 4 cents per card. Laminating just one surface provides an adequate defense against dirt.

Replacing a card once a job cycle has begun costs 49 cents in material and labor.

first in silicones

Dow Corning

SILICONE NEWS

production and maintenance edition • No. 38

CLEAN MOLDS CUT COSTS

This spray saves money every time the mold opens. For when the finished pieces release cleanly and quickly, production moves right along. But if the parts stick, you're in trouble. Scrap increases and production costs soar.

There is a way to make sticky products pop out perfectly, time after time. Here's the evidence:

Vail Rubber Works, St. Joseph, Michigan, fabricates seals, packings, pads and other mechanical rubber goods. Previously a soap-type release agent was used. Mold build-up was rapid; molds had to be cleaned every week. Since this was done on overtime, costs were appreciably high.

Then Vail production men switched to a Dow Corning silicone mold lubricant — spraying it on molds in a concentration of only two parts per hundred. After molding, parts release easily, cleanly. There is virtually no build-up on molds — cleaning is necessary only once every five or six weeks. And the actual time required to do the cleaning is cut in half. Moreover, Vail Rubber has found that the surface finish of products is better!

Peak performance like this is typical of Dow Corning release agents in all forms: 100% silicone fluids, water-dilutable emulsions, grease-like compounds, and solvent dispersions. They save time, money; improve quality. Investigate today! ***No. 647***

MUSCLES FOR A CRUSHER

Reducing limestone from pebble size to fine powder is a tough grind. It's especially tough on the "innards" of the motor that drives the crusher. But today, getting motors that are immune to constant vibration and attack by pulverized rock and other punishing abrasives is a simple matter of specifying a resilient insulation system.

Faced with this problem, Quality Limestone Co., of Sussex, Wis., specified a motor insulated with Dow Corning Silicones to drive their Bradley-Hercules mill. This motor — a 300 hp, 440-volt, 400-rpm Super-Seal squirrel-cage induction motor — was designed by Allis-Chalmers to take maximum advantage of the unique properties of silicone rubber insulation. These include outstanding resistance to moisture, chemicals, oils, corrosives, abrasives and extreme heat.

Because of the resiliency of the silicone insulation, the motor takes all of the rugged jolts, shocks, shakes and vibrations this limestone crusher can dish out . . . and keeps right on going. Another important plus: silicone insulation shields delicate rotor windings and coils from the most severe surroundings without the need of expensive protective housings. Thus, important savings are realized in both initial cost and upkeep.

Dow Corning silicone insulation is enabling many other motors to "play out of their league", too; putting an end to overmotoring to meet overloading. And such savings are not confined to *new* motors. Your present motors can be rewound to boost their efficiency. Know of a motor that needs help like this now? ***No. 648***

6 Years at 650 F

Paint a hot spot with a silicone based paint and you can forget about it. At least this has been the experience of Saginaw Bearing Co., Saginaw, Mich.

In the spring of 1954, Saginaw Bearing had a paint problem with their tilting bronze-melting furnaces, operating 10 hours a day. Surface temperatures were in the range of 650 F. Even the best quality, high temperature organic paints blistered and peeled within a few days . . . often within a few hours. (*Cont. pg. 2*)

FOR DATA RELATING TO THESE ARTICLES, CIRCLE REFERENCE NUMBER IN COUPON ON NEXT PAGE OR REFERENCE NUMBER ON READER SERVICE CARD

MORE

27,000 CHANCES TO FAIL

When just one over-heated bearing can "freeze" and make production quit cold, imagine 27,000 bearings subjected to heat as high as 700 F! Here's how one company faced this problem and eliminated it before it could cause trouble.

At the Freeport, Texas, plant of The Dow Chemical Co., metal drums filled with molten caustic soda must cool before they can be handled. So after filling, the drums are switched from a conveyor to a series of roller tracks, slightly canted so the drums can roll into line by themselves. They stand on the tracks for a full sixteen hours, radiating a searing heat of up to 700 F that tortures rollers, bearings and grease alike! Despite such punishment each of the 26,900 bearings — supporting 11,000 rollers — must always be ready to turn freely, smoothly.

Ordinary lubricants would never survive an environment like this. Therefore, when the roller tracks were installed in 1948, the bearings were lubricated with Dow Corning 41 Grease. Except for periodic inspection, rollers and bearings required no maintenance until 1955. When a few rollers began to stick, all bearings were relubricated with this same silicone grease. Just recently, after five more years without relubrication, the rollers and bearings were checked again and found to be in excellent operating condition.

The caustic drums still reach 700 F — still sit and cool for sixteen hours. But — though lubricated only twice in twelve years — rollers and bearings still spin smoothly. If your job is to make bearings bear up when heat bears down, remember Dow Corning silicone lubricants. There's one that can help you. *No. 649*

6 YEARS AT 650 F *(Continued)*

Then, a single coat of an aluminum paint, based on Dow Corning silicone resins, was brushed on. Furnaces were put back into operation, the coating curing in service. Today, almost seven years later, that protective coating is still in good condition; is still protecting surfaces that reach temperatures of 650 F for three to ten hours a day.

Have a hot spot to protect? A spot that may get as hot as 1000 F? Chances are a paint with Dow Corning silicone resins will do the job. *No. 650*

new literature and technical data on silicones

Silicones for the Automotive Industry is the subject of an 8-page brochure that describes how silicones provide practical answers to operational and maintenance problems common to many industries. Savings in time, labor and money with silicone surface protection, electrical insulation, lubricants, defoamers, parting agents, and Silastic,® the Dow Corning silicone rubber, are outlined for you in this valuable reference. Send for your copy. *No. 651*

A B C's of Defoaming — the literal ABC's to fast antifoam action are compiled for you in a new comprehensive brochure on Dow Corning silicone foam suppressors. This 8-page booklet gets down to cases showing how just ¾ ounce of silicone antifoam can stop foam in a 5,000 gallon metalworking pickling solution. These versatile antifoam agents are actually reducing maintenance time . . . processing time . . . costs . . . while increasing production capacity . . . efficiency . . . economy in almost every industry. This new manual on foam control discusses the processing of chemicals, ceramics, petroleum, asphalt, paper, textiles, food, drugs, and the metalworking industries. *No. 652*

Surface-Maintenance Money Saver — Silicone-based paints provide up to 200% longer service life on such equipment as stacks, mufflers, oven walls and similar areas of extreme surface temperatures. Case histories featured in this 4-page brochure demonstrate how equipment can be kept rust-free and attractive longer even in corrosive atmospheres . . . where temperatures are up to 1000 F. A new paint selector for choosing the best type of paint for every application is on the back cover, and the reference points out the service you can expect from the superior weathering properties, heat stability and corrosion resistance that are inherent in paints formulated with Dow Corning silicone resins. *No. 653*

Guide to Silicones and Their Uses—This 16-page manual outlines the forms, properties, and applications of Dow Corning Silicones . . . summarizes how these versatile materials help engineers keep production moving — how they help to keep maintenance and downtime to a minimum. Send for your copy of this valuable reference today. *No. 654*

Dow Corning Corporation, Dept. 3812, Midland, Michigan
Please send me: 647 648 649 650 651 652 653 654

NAME _____

TITLE _____

COMPANY _____

STREET _____

CITY _____ ZONE ____ STATE _____

SILICONE NEWS is published for production and maintenance men by

first in silicones

Dow Corning CORPORATION
MIDLAND, MICHIGAN

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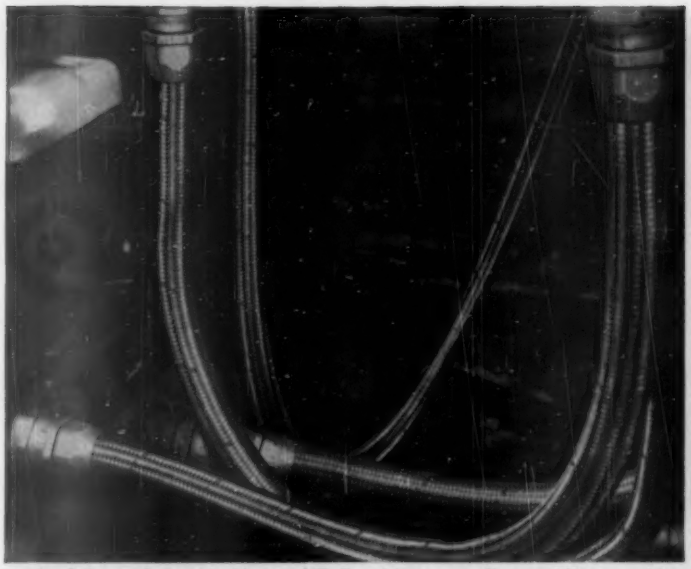

Each of these Aeroquip Hose of Teflon Lines supplies molding machine with live steam and cold water in rapidly alternating cycles.

Top: Royal typewriters travel in molded cases. Bottom: Polystyrene is molded into shipping case halves.

Aeroquip *Hose of Teflon* shrugs off fast temperature change cycles at Royal McBee

Royal McBee Corporation, Hartford, Connecticut, ship their famous Royal typewriters protected by special polystyrene containers molded in their Springfield, Missouri plant.

Molding presses for these cases are equipped with four Aeroquip Hose Lines of Teflon with ***"super gem"*** Reusable Fittings*. Besides undergoing constant flexing from press action, these hose lines must first carry live steam at 240°F. at 20-25 psi for one minute, then carry cold water at 60-70°F. for half a minute to chill the mold. This fast cyclical exposure to severe temperature change and flexing is shrugged off by the Aeroquip Teflon inner tube and braided stainless steel outer cover. This means long service life and minimum machine downtime for hose replacement. Additionally, accident conscious Royal McBee feels there is no safer hose than Aeroquip Hose of Teflon.

Let your Aeroquip Distributor show you how Aeroquip Hose of Teflon and many other types of Aeroquip Hose and Reusable Fittings can save you time and money in plant maintenance. He is a fluid piping specialist. He will give you a copy of our Industrial Catalog 204 and explain why you are in good hands when you consult with Aeroquip. He is listed in the "Yellow Pages" under "Hose."

*U.S. Patent Nos. 2,833,567 and 2,731,279
"super gem" is an Aeroquip Trademark
Teflon is DuPont's tradename for tetrafluorethlene resin

Aeroquip is so easy to use . . . your inventory is just a few feet of hose and a handful of fittings.

STANDARDIZE ON AND SPECIFY

Aeroquip

TO MAINTAIN THE PACE OF PROGRESS

AEROQUIP CORPORATION, JACKSON, MICHIGAN

INDUSTRIAL DIVISION, VAN WERT, OHIO • WESTERN DIVISION, BURBANK, CALIFORNIA
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AEROQUIP PRODUCTS ARE FULLY PROTECTED BY PATENTS IN U.S.A., CANADA, AND ABROAD

HUMAN RELATIONS

By V. E. LUNARDI, Assistant Editor, FACTORY

Why not a manpower audit?

A man's value is about 96¢ when broken down to chemical elements. Yet industry doesn't feel he's even worth that much. We're talking about American business spending millions for research and development, but only pennies for personnel inventory.

Lon D. Barton, president of Cadillac Associates, Inc., Chicago management consultants, marshalled these facts to back up his charge.

1. Nearly all companies take annual inventory and audit physical resources—few make annual audits of manpower on hand; namely, talent, background, and experience of men to fill particular jobs.

2. If such inventories exist, even fewer companies update them when new work is done by these men which may prove valuable.

3. Job profiles have an even worse history. Much turnover among middle-range executives is due to lack of knowledge of what is expected of them. They leave this never-never land for jobs where their duties are more clearly defined.

4. Most job profiles are a joke. Those that are adequate have often not been revised in 10 years to account for new conditions. Or else no attention is paid to them if they do exist.

A management responsibility—the problem of personnel inventory and job profiles—has been neglected too long. One executive should be responsible for periodic reviews of job histories. These could be kept on simple-to-maintain file cards, Barton concludes. One use for system: Projecting your manpower potential for one, five, or even 10 years ahead.

Your job in a nutshell

Wanna bet you can't tell us the difference between a supervisor, manager, and an administrator in five minutes? Whether you are one or deal with one, chances are it will take a half-hour's verbal wading through specific duties to define each job. Edward N. Hay & Associates, Philadelphia management consultants, have done it for you. Here are their concise descriptions:

A supervisor tells people what to do and how to do it. He oversees work of individuals and/or performs his own duties with end result of executing a single, cohesive function.

A manager tells people what to accomplish in fairly specific terms. Working through a group of subordinates, he integrates and coordinates their dissimilar functions to accomplish a common objective.

The administrator assigns general objectives, but gives little or no consideration to the detailed methods of their accomplishment. A strategist, he lays down the aims for his organization by taking into account competitive, technical, and governmental forces that influence its function and progress. And he constantly reviews these objectives and their execution in case current developments dictate a change.

Did we leave some of you straddling a fence?

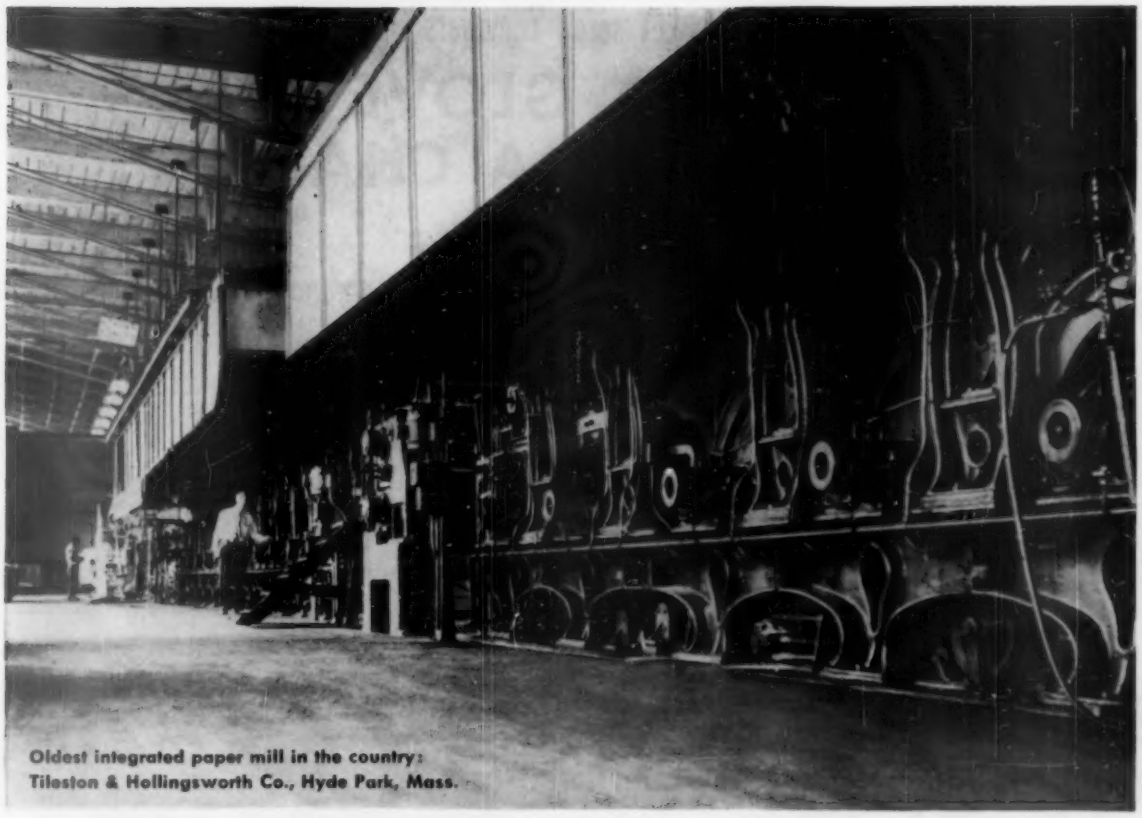
Pint lost—paradise gained

For management, bled white trying to think up ways to lift blood bank quotas, we offer this shot in the arm. It's a Lockheed Aircraft Corporation (Marietta, Ga.) gimmick that's expected to kick up a storm of pints—with standing room only on the blood donor line.

Company holds out hope to every donor of recouping his lose on an idyllic isle off the Georgia coast. But only one donor (and his family) will share this "millionaire's vacation" for being the name drawn out of the hat.

The incentive package includes a new set of luggage plus $300 in folding money, and a two-room suite (with kitchenette) at a plush motel on Jekyll Island. A winner who doesn't feel up to this sort of high living can always choose the alternate prize—a $500 U. S. Savings Bond.

Turn the page



Oldest integrated paper mill in the country:
Tileston & Hollingsworth Co., Hyde Park, Mass.

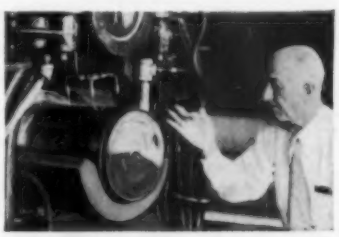
Lubrication engineer switches 230-year-old mill to Cities Service Lubricants

William D'Entremont, Lubrication Engineer for the Boston Office of Cities Service, spent three days at the Tileston & Hollingsworth paper mill making an extensive survey of their operations. He checked over dozens of machines with hundreds of lubrication points. His report convinced management to switch to Cities Service lubricants. Mr. D'Entremont's recommendations reduced the number of lubricants used by the company by one third, and at the same time increased efficiency of operations.

Typical of the Cities Service lubricants now used by Tileston & Hollingsworth are several types of Trojan grease, each fulfilling a specific and rigorous requirement. The unique properties of Trojan greases are the result of scientific use of laboratory-tested fortifying chemicals. Mineral oils comprise the largest percentage of the ingredients in Trojan greases. Only such oils are employed that are known to give the best results required of a given type—a knowledge gleaned from years of research and experience in the manufacture of high grade greases for a host of critical customers.

To learn how Cities Service lubricants can help you in your business, call the Cities Service Lubrication Engineer in your area. Or write: Cities Service Oil Company, Sixty Wall Tower, New York 5, N. Y.

The original charter establishing this company was issued in 1728 by the Provincial Government in Mass. In its first year the charter called for the company to make *"Two hundred Rheams of good Merchantable Brown Paper and Printing Paper"* plus *"Fifty Rheams of Writing Paper of equal goodness with the Paper commonly stampt with the London Armes."* Today the mill produces that much paper in an hour.



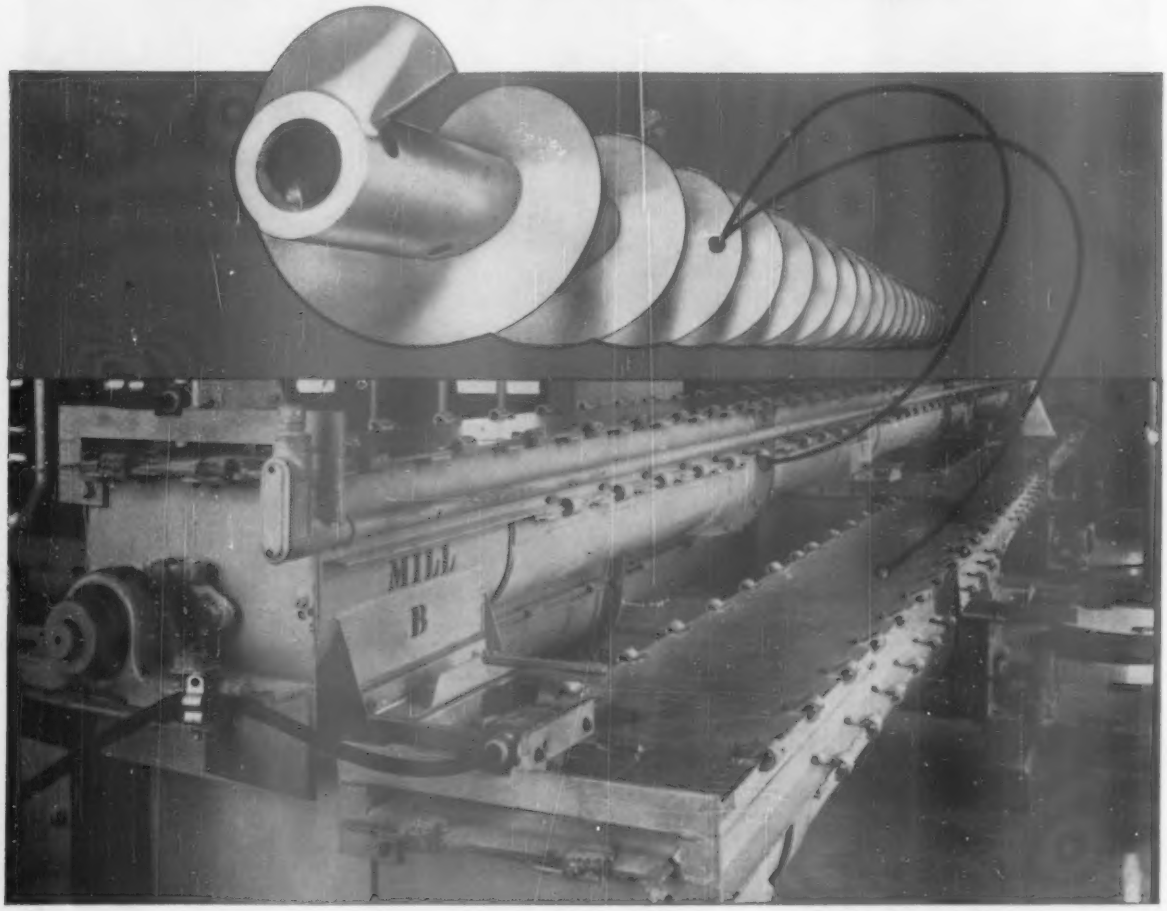
William D'Entremont checks paper mill's machinery. His recommendations reduced number of lubricants used by company by one third.

CITIES SERVICE
QUALITY PETROLEUM PRODUCTS

For more facts Circle 456 on Reader Service Card

Why a system of LINK-BELT screw conveyors

FITS LIKE A GLOVE AND WORKS LIKE A CHARM



- **Thorough engineering analysis of all conditions**
- **Full responsibility for satisfactory performance**
- **Unbiased selection from industry's most complete range of components**
- **Expert field erection**

With Link-Belt, screw conveyor engineering includes far more than just supplying a suitable product. All related aspects of your production are considered—including prior and subsequent handling, plus integration with other equipment. And because Link-Belt handles all details from specification to erection, it means a better-working system with less work for you.

Continuous product improvement and development by Link-Belt has produced industry's widest range of components for screw conveyor applications—various types of flighting, gates, troughs, drives . . . plus a new line of ball and roller bearing equipped accessories.

Link-Belt specialists will work with you to determine the feasibility of adapting screw conveyors to your operation. Call or write your nearest Link-Belt office for full details. Ask for Book 2989.

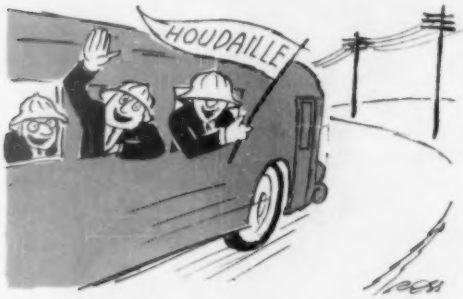
LINK-BELT

SCREW CONVEYORS

LINK-BELT COMPANY: Executive Offices, Prudential Plaza, Chicago 1. To Serve Industry There Are Link-Belt Plants and Sales Offices in All Principal Cities. Export Office, New York 7; Australia, Marrickville (Sydney); Brazil, Sao Paulo; Canada, Scarboro (Toronto 13); South Africa, Springs. Representatives Throughout the World. 15,234

For more facts Circle 457 on Reader Service Card

Begins on page 154



Big wheels go, to get in the know

Cooperation nearly zero between you and the board of directors? It needn't be if you can get them to tour the plant. That's what was done at Houdaille Industries, Inc., (Buffalo) under the sponsorship of chairman Ralph F. Peo. He believes that intelligent decisions on corporate affairs can only be reached by a well-informed group of directors. And to be well-informed means gaining first-hand knowledge of plant operations.

So periodically, Peo arranges bus tours to company facilities for his board members. The most recent one took eleven directors to eight company plants in New Jersey. Incidentally, safety helmets are *de rigueur* for the tours.

Why don't you, the man who knows the plant best, plan such a tour for your board of directors?

Gifts buy crayons or computers

An expanded aid-to-education program is putting all hourly employees on the gift-giving team at Pitney-Bowes, Inc., Stamford, Conn. The postage meter and business machine manufacturer will now match all donations to any recognized non-profit school, public or private, as well as colleges and universities.

Covering the entire sphere of education, from kindergarten to university graduate schools, program permits workers who did not pursue higher education to support their favorite schools. Company doubles employee gift ($5 minimum) up to $1000 in any one year. All 4650 employees may donate to eligible institutions whether or not they attended them.

Classy people: handle with care

Get ready for a new era in employee relations. Personnel policies, guided for the past 30 years by an approach to the "masses," will need revamping to appeal to the "classes." That's the opinion of Albert F. Watters, personnel vice president of General Foods Corporation, White Plains, N. Y.

This shift in emphasis is due to changes in population, markets, foreign trade, technology, and educa-

SEE IT WHEN IT

HAPPENS!

PHILCO CLOSED CIRCUIT TV has many applications that will speed production, control operations, improve communications, increase security *in your plant!*

Industry is rapidly adopting closed circuit TV to speed operations and reduce costs by enabling management and operating personnel to "see it when it happens"! Philco's broad experience in CCTV will help you to make the most efficient use of this modern and flexible business tool. Philco has pioneered in fully-transistorized equipment that provides maximum reliability and freedom from maintenance. It is as easy to operate as your home TV. Write today for your free copy of the Philco Closed Circuit TV System Planning Guide.

PHILCO ALL-TRANSISTOR SELF-CONTAINED CCTV CAMERA
For the finest in closed circuit TV

GOVERNMENT & INDUSTRIAL GROUP
4700 Wissahickon Ave., Philadelphia 44, Pa.
In Canada: Philco Corp. of Canada, Ltd., Don Mills, Ontario

PHILCO®
Famous for Quality the World Over

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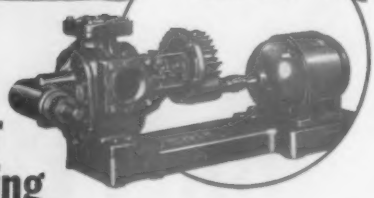
series 3600



built to transfer everything from anti-freeze to varnish

• **CAPACITY: 40-300 GPM** • **PRESSURE 100 PSI**

The liquid transfer applications for Roper Series 3600 pumps are almost endless . . . glue and adhesives, liquid sugar, anti-freeze, diesel or lubricating oil, inks, and substances having little or no lubricity such as hydrocarbons and solvents. Shown is an installation where varnish is pumped from basement to the third floor. With 3600 pumps, flow is smooth, even, without pulsation, regardless of changes in discharge pressure or viscosity. Construction is standard-fitted, bronze-fitted, or all-iron. Packed box or mechanical seal. Built-in face plate relief valve adjusts over 20-100 psi range, allowing stoppage of flow without halting pump.

Construction and Operating Features

- **COMPLETE, COMPACT** . . . requiring little space
- **GEAR REDUCTION** . . . enclosed, running in oil . . . hardened for long life . . . three gear ratios interchangeable in each size
- **BEARINGS** . . . four high-lead main pump bearings . . . gear reduction uses anti-friction bearings throughout
- **PUMPING GEARS** . . . two equal size hardened alloy helical gears running in axial hydraulic balance
- **TOP AND SIDE PORTING** is standard

For full information, contact your Roper dealer.

Send for "How to Solve Pumping Problems" booklet.

ROPER HYDRAULICS, INC.

Dependable pumps since 1857

COMMERCE, GEORGIA

158 **For more facts Circle 459 on Reader Service Card**

Begins on page 154

tion. Smaller groups of highly-skilled workers are now the common denominator instead of mass groups of factory employees.

To meet their special needs, Watters suggests these approaches: More informal job relationships in work groups; better selection processes for hiring; stimulating environment to encourage self development; and "psychic income" to supplement monetary compensation.

Wives up front in safety drive

The housewife is emerging as a crusader for plant safety. No back seat driver, she's front and center when it comes to effectively promoting safety on the job. After all, says Rocco B. Bunino, a Pabst Brewing Company (Milwaukee) vice-president, doesn't she have the most to lose?

In the long run, the wife suffers if the breadwinner is off the job because of job carelessness. That's the reason safety campaigns should be planned with her in mind.

Take the experience of his company, for example. Safety appeals to salesmen to cut down highway accidents failed to produce results. But once the safety director appealed to the wives for cooperation, the picture changed. Highway accidents were cut in half to the mutual benefit of wives and company.

A monument to mistakes

If you have a sewer drain handy and plenty of scrap, you've got all the trimmings necessary for a drive to cut down waste. The Gates Rubber Company, Denver, combined these elements into an attention-getting display in its plant courtyard.

Hanging from an arrow-shaped sign reading "down the drain," a 40-ft. column of scrap is suspended over a sewer drain. That's where your money goes is the implication supported by a poster saying "every five minutes around the clock we make this much scrap." Other messages call for employee cooperation to cut down waste—in the interest of job security. Scrap was collected from nearly all company divisions to make this eye-catcher.

For more facts Circle 460 on Reader Service Card ➤

Air operates this folding machine to provide the neatly folded, factory-fresh shirts found in popular shirt stores. In the background, left, is an air- and steam-operated pressing machine that furnishes smoothly pressed shirts in seconds.

Compact 25S2 distributes air through 2-inch air-mains and laterals to individual machines. Mr. Hopper, (at right), expects "many years of trouble-free service from the Model 25S2 compressor."

Van Heusen "cuts operator fatigue– ups output per machine by 10% to 20%" with a

LE ROI 25-HP STATIONARY COMPRESSOR

Shirt-making is exacting work. It's so tiring that an operator's output can drop 40% in five hours. To reduce fatigue and to maintain efficiency, "we prefer air control for the more delicate operations of sewing and trimming machines, laundry, pressing and creasing work," reports Charles G. Hopper, assistant to the production manager of the Pottsville (Pa.) plant of Phillips-Van Heusen Corp.

At least some of the credit for reducing fatigue and increasing production is given to the 25 horsepower Le Roi compressor which provides air-power in their shirt factory.

The 105 cfm, 125 psi capacity of the Le Roi 25S2 air-cooled compressor more than meets current needs, and provides for the addition of more air-operated machines. Mr. Hopper states that the unit operates 10 hours a day, five and one-half days a week. To assure dependable air supply, valves of the 25S2 are inspected weekly, and oil is changed every 200 hours.

Why don't you check the benefits of pneumatic operation? Le Roi can meet your needs with Westinghouse unit-type and Le Roi stationary air compressors from ½ to 100 hp. See your Le Roi distributor for more information. Or write to Le Roi Division, Westinghouse Air Brake Co., Sidney, Ohio.

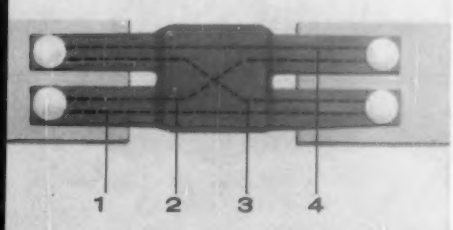
LE ROI STATIONARY COMPRESSORS

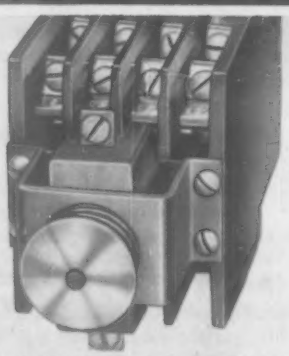
SC-09

PORTABLE AND TRACTAIR® AIR COMPRESSORS • STATIONARY AIR COMPRESSORS • AIR TOOLS

Another Cutler-Hammer first! Up to 24 poles in an area less than the size of a dollar bill.

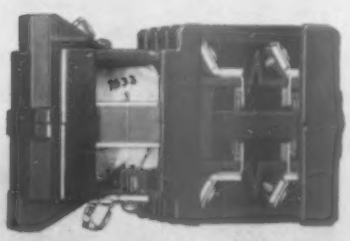
New contact reliability. Parallel bifurcated contacts, which allow four current paths instead of one, provide infinitely greater circuit reliability . . . liberally designed so any current path carries full relay rating.





At last! "Mechanical memory" latch as reliable as the relay itself! No adjustment ever needed. Add latch at any time.

New simplified design! Cutaway view shows basic simplicity. Coil vacuum impregnated to resist damage from humidity, vibration, electrical stress. Terminals can be screw or spade type.



Space savingest relay you've ever seen: New Cutler-Hammer "Compact 300"

Versatile 300 V. control relay is so reliable it's permanently sealed!

Here is the best answer yet to the need for an extremely reliable, small-size 300 V. industrial relay—the new Cutler-Hammer "Compact 300."

Every detail known that affects relay reliability has been improved in the "Compact 300." Bifurcated contacts which make possible *four* current paths rather than one, add millions of operations to the "Compact 300's" electrical reliability.

In fact, we're so confident of its electromechanical reliability, we permanently enclose the "Compact 300." And, if it should be damaged by a fault current, you throw it away and replace it with a new one. Its low price makes this an economical, practical maintenance procedure.

Now think of the space you can save with the "Compact 300." It controls up to eight circuits in panel space only 2″ wide by 2¾″ high. 2, 3, 4, 6 and 8 poles with any combination of N.O. or N.C. contacts are available, of course.

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By PAUL A. KING, Member, New York Bar

Can you pick the man to promote by giving tests?

Written tests can help you choose between job applicants . . . sometimes. But just when are they valid? This decision clears up the confusion.

NEWS TIPS

For comparing worker cost-of-living in various cities of the U. S., take a look at the new Bureau of Labor Statistics survey of typical family budgets. Items in the budget are the same for each of 20 cities. While the budget may not measure up to the standard for your employees, it will help you compare one area with another.

There's not much you can do if the NLRB insists that a hearing be held during production hours and that witnesses be released to attend. The NLRB ruled that your right to keep the production line moving is second to the employee's right to testify against you. It held that an employer committed an unfair labor practice when he threatened a worker-witness with discharge if he testified during working hours.

The amount you pay out in fringe benefits is a useful fact to have at the bargaining table. A recent U. S. Chamber of Commerce survey lists the benefits customarily included in the picture. It tells how to compute your package, and sets forth a table of fringe benefit figures for various industries as a basis for comparison. Cost: $1. Write to the Chamber at Washington 6, D.C.

If you want the absolute right to fire a worker during his probationary period, make certain that your grievance clause distinguishes between regular and probationary employees. Because a contract of Phillips Petroleum didn't, the company had to arbitrate discharge of a worker during his 90-day probationary period.

A frequently-found promotion clause reads that the senior worker is to get the job if the skill, ability, experience, physical fitness of all bidders are relatively—or approximately—equal. If you have one of these clauses, the reasoning of Arbitrator Maurice O. Graff in the Caradco case will be of value to you.

In analyzing what you can do under such clauses, your first step is to determine whether the skills of the job bidders are approximately equal. Can you use written tests for this? Graff states the general rule as being: "Management may use written tests to help determine relative capabilities of applicants." If this is so, why have some arbitrators denied management's right to use such tests? In one case an arbitrator stood behind a union that forbade its members to take welding aptitude tests to determine their qualifications for a spiral weld-type machine operator job. Another arbitrator held that a micrometer reading test couldn't be given to an applicant for a tool crib attendant job.

However, Arbitrator Graff ruled in the case before him that a clerical aptitude test *could* be given for a similar tool crib attendant job. What's the distinction? Graff tries to explain by pointing out that there are conditions attached to the general rule. Backtracking, he said: "Management may use tests to assist in determining the qualifications of an employee for a job (1) if the responsibility for making the determination of qualifications is management's, (2) if the tests are reasonably adapted to the measurement of the requirements of the job, and (3) if they are used fairly and reasonably for this purpose."

The welding aptitude test wasn't in the cards because the welding skill required on the job could be learned in a short time. (In fact, one of the employees assigned to the job had no welding experience at all.) The micrometer test for the tool crib attendant job was also an unreasonable requirement since the reading of a micrometer could be learned rather quickly. (Besides, the contract had a trial period provision.)

But the clerical aptitude test for the tool crib attendant job (in the case before Graff) was okay because the job description emphasized clerical duties such as keeping records of costs, instruments, and tools. It also called for checking incoming supplies against a list, making reports and calculations, and reading charts and production sheets. Graff thought that "aptitude for performing these functions can hardly be acquired by experience on the general run of production jobs. The company was justified in seeking some more objective measure of clerical aptitude to assist in determining which of the applicants possessed at least minimum qualifications for the clerical aspects of the job."

Having ruled that management was within its rights in giving written tests, the next question to come up was: Did the tests used by management reasonably measure the required clerical aptitude? His answer? Yes. Five tests comprised the series. They tested (1) the ability to understand, learn, and to solve simple problems, (2) ability to compare names and numbers, (3) ability to copy numbers, (4) ability

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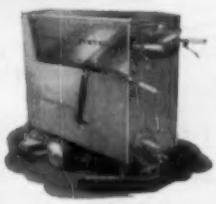

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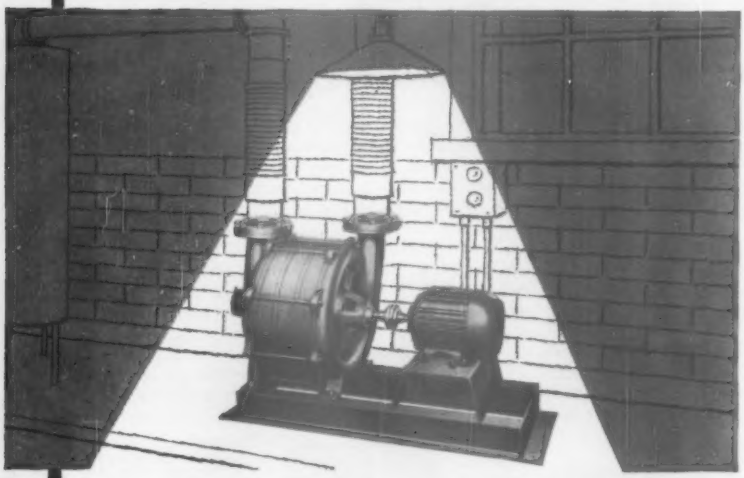

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Begins on page 162

to solve simple problems of addition and multiplication, and (5) ability to copy names.

The last question the arbitrator pondered was: Did the company discriminate in administering the tests? And his conclusion was: No. Our conclusion: Tests are okay if they meet the requirements reviewed by arbitrator Graff. But before you rely on his analysis, make sure that your clause is substantially similar, that there are no negating clauses in the contract. More important, be sure there are no side agreements or plant practices which would result in an adverse ruling in your situation.

Overtime lawsuits

Written policy and a tight upper lip may avoid lawsuits.

This whirlwind Horatio Alger rose from stock boy at modest wages to production manager at $144 a week within a year. But that was not enough. He sued the company for $7000 as overtime pay due under (1) the Wage-Hour law and (2) under an oral agreement with the plant manager. It didn't matter to him on which basis he won the suit —so long as he won.

A review of this employee's duties convinced the court that he was exempt from the Wage-Hour law as an administrative employee. And logic convinced the court that his plant manager was not likely to have made an overtime agreement with him. (Under such an agreement, the employee would have earned more than the plant manager.) Fortunately, the case was thrown out. But written overtime policies communicated to employees might have dissuaded an attorney from taking the case to begin with (thus avoiding the burden of litigation).

Promotion tests

No advance answers for the union, rules the NLRB's General Counsel.

Every school kid dreams of getting the answers before an examination. Their union fathers had similar visions when they demanded their employer furnish the union with the

answers to job-qualifying tests. The union wanted to make sure that the answers were pertinent. It had also complained about the company's changing tests without consulting the union. What the company did was an unfair labor practice, the union charged.

The NLRB's General Counsel made short work of the complaint, kicked it out fast. Under the contract, the company was allowed to use its judgment in filling posted jobs. The company could, therefore, change tests in midstream: It had no obligation to give the answers to the union.

Insubordination

How delicate are foremen? To what extent must we protect them from the bad language of working men?

A plant is no cloistered sanctuary for those who want to pray. In every plant there's feudin', fussin' and cussin'. The only question is: How much foul language must a foreman take before he can justify suspending or firing a worker for insubordination. Arbitrator Robert S. Thompson reviewed these seven cases of insubordination.

In case one, an employee was suspended for a week because, in challenging the validity of a no-smoking rule, he said he would get his smoking breaks no matter what. He didn't give a damn. The arbitrator upset the suspension. What this employee said was chargeable to anger and vehemence. It wasn't defiance of managerial authority.

In the second situation covered by Thompson, a union steward cursed a foreman when he was asked to terminate a discussion of a grievance and to return to work. This was insubordination and the arbitrator upheld the discharge.

In case three, a discharge was upheld when an employee told his foreman to go to hell. But here the contract clause said use of abusive language (not only insubordination) was also cause for dismissal.

In the fourth case, an employee actually carried out a foreman's order, but during the 2- or 3-minute argument with his foreman, he insisted he wouldn't. The arbitrator ordered reinstatement.

In case five, the arbitrator found that "the employee's conduct in the presence of his fellow-employees was not conducive to good discipline. His arrogance in ignoring his supervisor, his use of profanity, regardless of the degree of obscenity involved, and his refusal to heed his supervisor's instructions while on company property were not proper and set a bad example for his fellow workers." Despite all this, he was reinstated—but without back pay.

In overruling discharge for use of profane and obscene back talk to his foreman, the arbitrator in case six held: "On the spot discharge of an employee who replied with profane abuse to a reprimand by a foreman is not just cause where: (1) the language used was part of the common daily language of the work crew; (2) the job in progress at the time was of a type to create nervous tension; (3) the evidence was in conflict as to the extent of disturbance created; (4) the employee continued to work in a satisfactory manner after the incident."

Then turning to the case confronting him, Thompson upheld the discharge of a worker who refused to accept a warning slip, and used obscene language to emphasize his position. The arbitrator concluded that the remarks of the employee would be considered obscene under the standards of the community in which the employee lived and by at least some of the employees who heard them. By his use of obscenity, the employee had flaunted the authority of the foreman. This was insubordination, and insubordination was cause for dismissal.

Arbitration or not?

Arbitration or no arbitration was the question in these two cases. The answer was yes where the union skipped two grievance procedure steps; no where the union wanted a no-subcontracting clause.

This firm refused to arbitrate a grievance because the union skipped two steps of a three-step grievance procedure. When the union took it to court to force it to arbitrate, the company argued that it was not an arbitrator's job to decide whether the union's failure to follow the grievance procedure was fatal to the union's case. It was up to a court. But the court—a U. S. District Court of Pennsylvania—decided that it was

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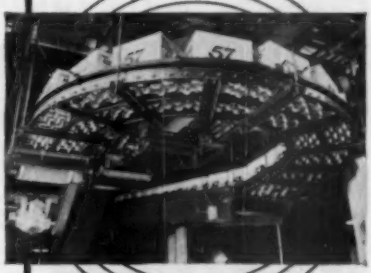

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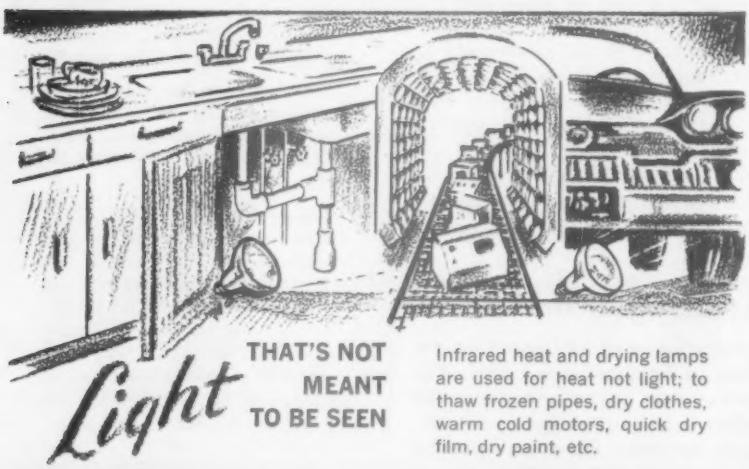

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Begins on page 162

not. It was the arbitrator's job.

In another company where the union tried to compel arbitration of the company's right to subcontract, the court decided that it was not a question for the arbitrator. The arbitration clause of the contract provided that proposals to add to or change the agreement were not to be arbitrable. During every negotiating session, the union had unsuccessfully tried to insert a clause in the contract against contracting out work. The court—this time a U. S. District Court of North Dakota—ruled that the union was trying to obtain, through arbitration, what it had failed to secure through negotiation.

Garnishments

Garnishments are a nuisance to employers. No question about it. Thus, discharge may be a fair penalty for the worker whose salary is garnished. But an employee must not be pressured into paying an unjust indebtedness to preserve his job.

Management and reasonable union leadership agree that a company is not required to put up with the inconvenience of withholding part of an employee's pay because of a wage attachment or garnishment. There's the time, effort and expense of extra bookkeeping, the need to file written returns with the attaching officer, the liability of the company to hold the funds in trust. And it is liable if it fails to follow the instructions of the attaching officer in paying out the funds. To avoid all this bother, some companies rule that an employee can be fired if a wage attachment is served.

One company in California ruled that an employee could be suspended until he had the garnishment lifted. But if too many garnishments were served on him then he could be fired. This rule made sense except for one situation. Management and union will agree that most garnishments are served to collect a valid debt. But once in a while, it's otherwise. Maybe the employee foolishly neglected to answer a summons, signed a confession of judgment he didn't read, or some similar act.

In some states as in California,

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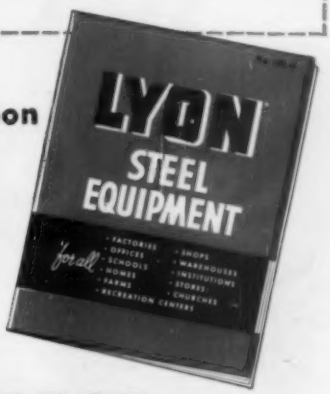

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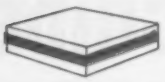

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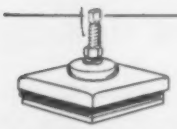

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Begins on page 162

where a garnishment may be served before a judgment is entered, the indebtedness may not have been proven when the garnishment order was served. In such cases, suspension without pay or discharge may be a harsh penalty. To preserve his job, the employee may pay a debt which is not his. This an employee of the American Brass Company, Los Angeles, was tempted to do. But the arbitrator suggested that where the employee contests the garnishment, he should not be fired. Thus, a reasonable garnishment rule might provide that an employee who does not lift the attachment within X days (depending upon the state), or contest it in that time by appropriate legal proceedings (or show evidence that he retained a lawyer for that purpose), only then shall he be suspended (or discharged). Of course, this may not relieve a company of garnishment burdens. But it doesn't put the heat on employees to pay unwarranted debts. Nor does it encourage unscrupulous creditors.

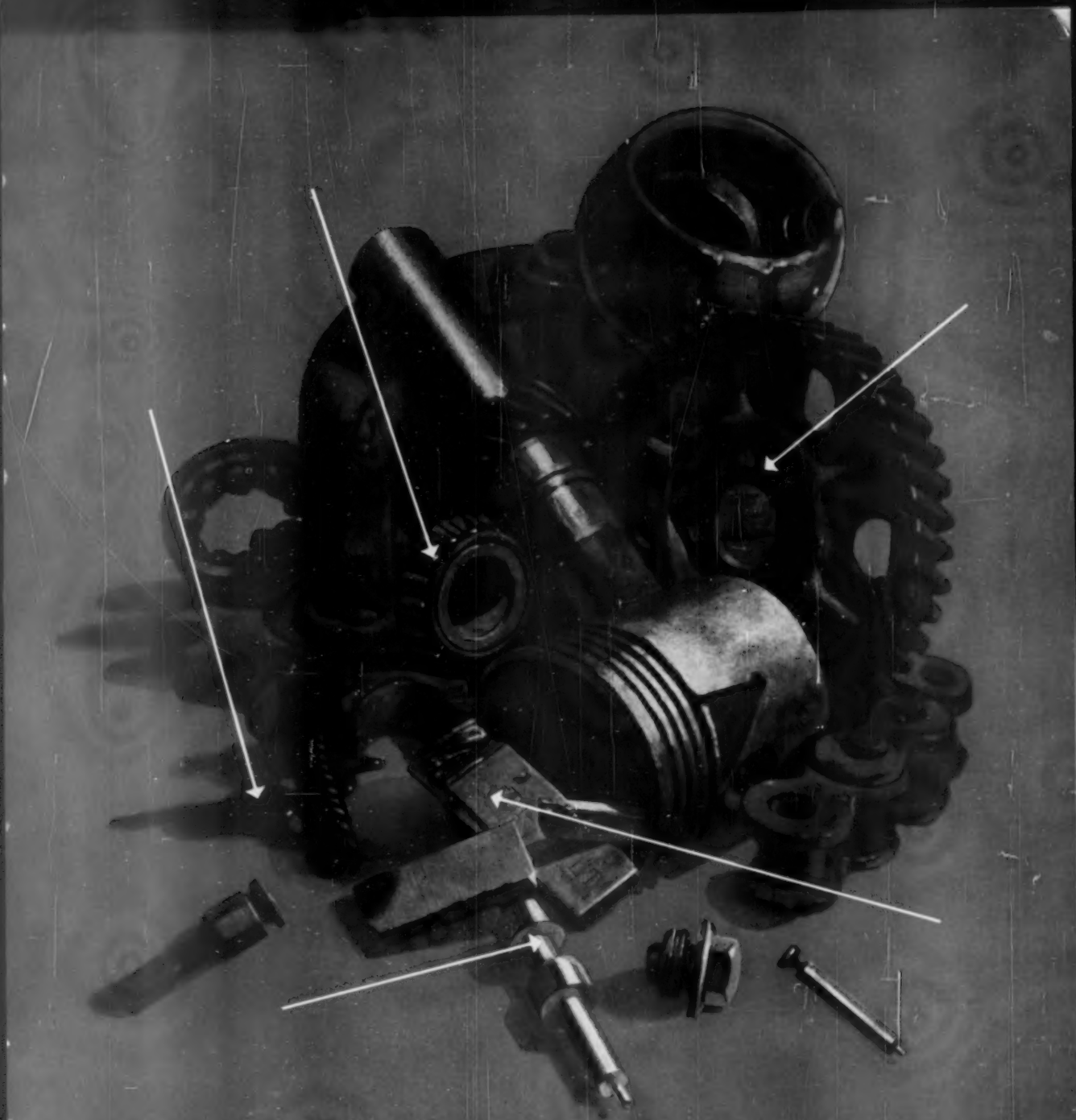
Death in the family

Is your wife's grandmother a member of your family?

Death in the family arouses sympathy even among the most hard-boiled employers. But occasionally employees take advantage of the situation. Then the company shells out while the employee goes fishing —not to the funeral.

To avoid goofing off, many contracts list members of the family whose death will entitle employees to days off with pay. The trouble with such a list is it never seems long enough. Or, as in the case of this company, it may overreach its goal.

The contract clause of Deere & Company's plant gave time off with pay to employees attending funerals of those in the "immediate family." The clause went on to list who would be considered members of the immediate family and included—among a long list of in-laws—grandparents. The question that arose: Did the funeral of the grandmother of an employee's wife entitle him to time off with pay? The arbitrator ruled that it did not.



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* and all it represents

(DAMAGED TOOLS, RUINED MACHINES, REJECTS, WASTED LUBRICANTS, UNSCHEDULED DOWNTIME...)

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Texaco has developed techniques and experience to make this new concept operative. They are offered to you, with the understanding that any Organized Lubrication program depends for success on those who adopt it and apply it.

Here's the help you need to starve YOUR scrap pile

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2. A film "package" for plant departments. This consists of movies on cutting oils, greases, hydraulic oils, etc., that may be selected for showing after seeing the "Stop Loss" film.

3. Coordinated booklets on the film subjects and others to be used as guides in specific areas.

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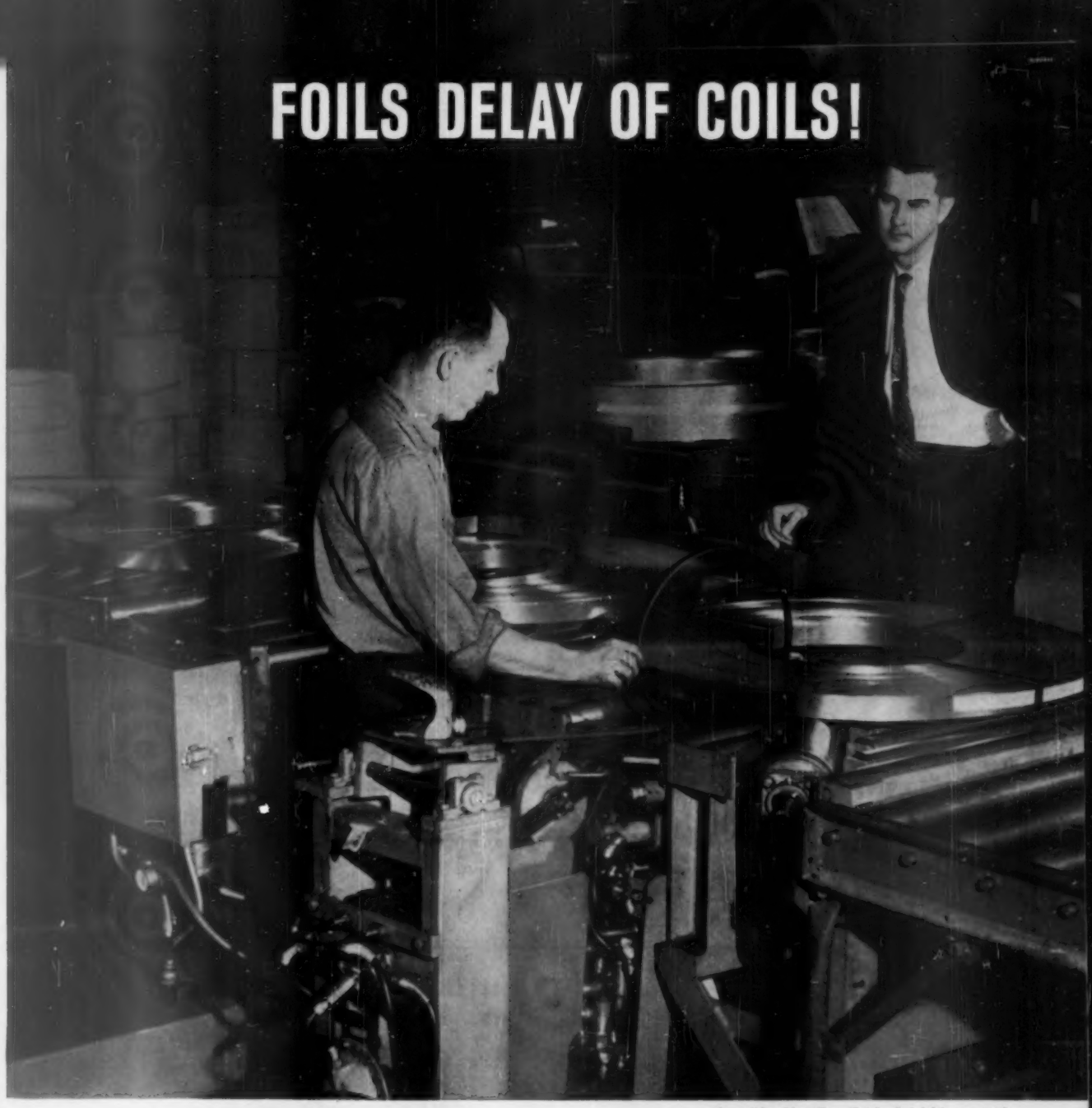

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IDEA LEADER IN STRAPPING

For more facts Circle 469 on Reader Service Card

ACME STEEL COMPANY
Acme Steel Products Division
Dept. FAS-120
135th St. & Perry Ave.
Chicago 27, Ill.

Please send me Idea No. S4-12 and examples of how major companies in my field use Acme Steel Strapping.

*Name*_____

*Title*_____

*Firm*_____

*Address*_____

*City*_____ *Zone*____ *State*_____

A LABORATORY IN JOHANNESBURG IS WORKING FOR YOU

Possibly you have never even heard of the Diamond Research Laboratory of Johannesburg. Yet its findings are of great importance to every user of industrial diamonds.

Established in 1947, the Diamond Research Laboratory is sponsored by Industrial Distributors (1946) Ltd. Its work is devoted exclusively to investigations on all phases of the diamond.

In its brief 13 years of existence, the Laboratory's developments have been of great significance. They include:

- increase in efficiency of natural diamond grit in resin and metal-bond grinding wheels
- considerable improvement in design and performance of diamond drill crowns
- development of electrolytic method of resharpening tungsten-carbide-tipped percussion drill bits
- development of diamond thermistors for highly accurate temperature measurements
- vector orientation, by X-ray, of diamond tool stones

Obviously, this intensive—and costly—research cannot be carried on by individual users of industrial diamonds. But Industrial Distributors, world distributors of natural industrial diamonds, has undertaken this responsibility for interested users throughout the world.

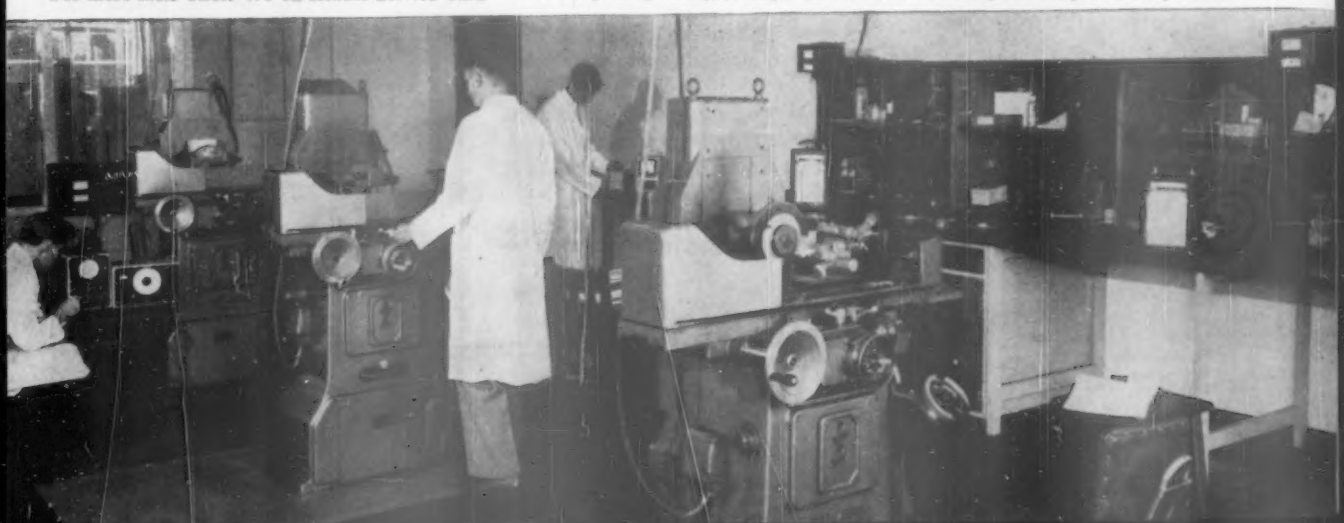
The Diamond Research Laboratory is in Johannesburg. But it's working for *you*.

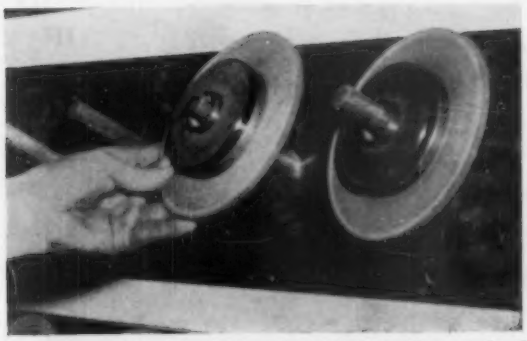
INDUSTRIAL DISTRIBUTORS (SALES), LTD., LONDON

INDUSTRIAL DIAMONDS CUT PRACTICALLY EVERYTHING . . . ESPECIALLY YOUR PRODUCTION COSTS

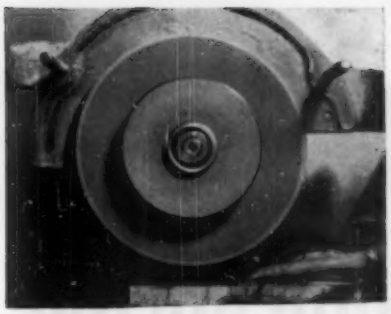
For more facts Circle 470 on Reader Service Card

Resin-bonded diamond grinding wheels are tested in a carefully controlled experiment. In two years of testing, 450 separate wheels were used to grind away two tons of carbide.



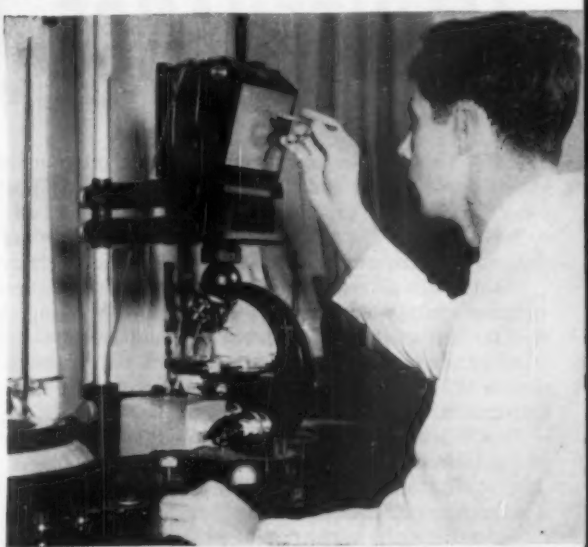


A specially developed type of grit enables resin-bond diamond wheels to grind rapidly and efficiently.

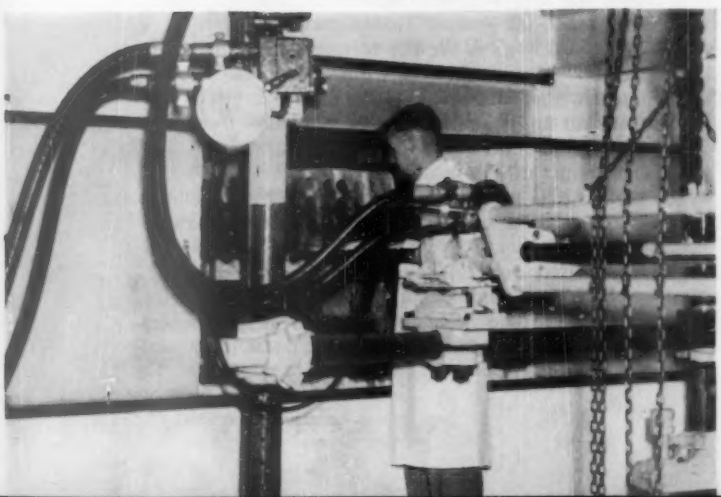


A diamond abrasive wheel is tested at the Diamond Research Laboratory by surface grinding a block of tungsten carbide.

Staff member counts number of diamond grit particles which appear on the screen of a microscope. This instrument was especially developed for checking the shape of diamond grit.



Laboratory drilling machine tests the efficiency of diamond drill crowns in granite.



IF YOU ARE INTERESTED in the Laboratory's work, please fill in this coupon. You will receive a copy of this attractive booklet outlining the function and the findings of the Diamond Research Laboratory.

DIAMOND RESEARCH LABORATORY
Johannesburg, P.O. Box 104, Crown Mines
Union of South Africa

Please send me a copy of THE DIAMOND RESEARCH LABORATORY.

*Name*_____

*Company*_____

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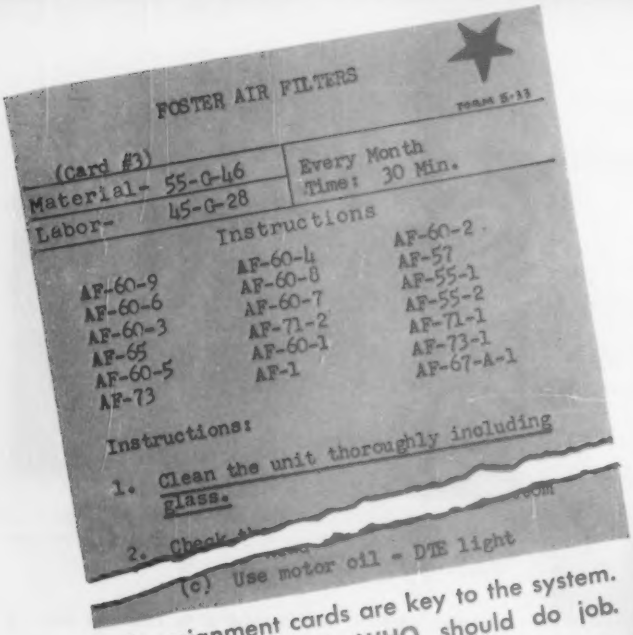
*City*_____ *State*_____


FOSTER AIR FILTERS

Form B-13

(Card #3)

Material- 55-G-46

Labor- 45-G-28

Every Month
Time: 30 Min.

Instructions

AF-60-9
AF-60-6
AF-60-3
AF-65
AF-60-5
AF-73

AF-60-4
AF-60-8
AF-60-7
AF-71-2
AF-60-1
AF-1

AF-60-2
AF-57
AF-55-1
AF-55-2
AF-71-1
AF-73-1
AF-67-A-1

Instructions:

1. Clean the unit thoroughly including glass.

(c) Use motor oil - DTE light

Job-assignment cards are key to the system. Star in corner tells WHO should do job.

Placement of cards in schedule racks tells workers WHEN the jobs need to be done.

MAINTENANCE SCHEDULING SYSTEM

This simple maintenance control program can save time and money in your plant. At Besly-Welles Corporation (B-W), South Beloit, Ill., it guards every detail with a minimum of paperwork.

The program has been functioning effectively ever since it was installed six years ago. Its designer—and chief beneficiary—is Roy Hill, B-W's superintendent of traffic, maintenance, and stores.

Here's what the program could tell you:

- Who should do the work—It's based on skill of mechanic or laborer.
- When jobs must be done—It's an automatic scheduling system.
- What must be done—It lists all operations to be performed, provides a ready reference to a set of detailed job instructions.
- Where every job is located—It keys work to locations in the plant or on the plant grounds.

The program covers maintenance of B-W's buildings and grounds (about 150,000 square feet on about 19 acres) and all equipment other than production machine tools. In principle, it can be applied to maintenance of any moderate-sized facility.

Once set up, it requires very little paperwork. At B-W it takes a woman clerk about 5 hours a week to keep it up to date. Supervision by Roy Hill averages 1½ hours daily, including supervision of janitorial service and plant protective activities.

The results? Three mechanics handle the work load, except for special jobs like big painting or re-roofing jobs. The program schedules about 95% of all jobs done, including routine care and preventive maintenance. The remaining 5% is mostly new work, with orders like "install an air hose" or "make a work bench." Rarely is it necessary to issue a special order for a repair. This fact in itself, claims Hill, is proof of the success of the program.

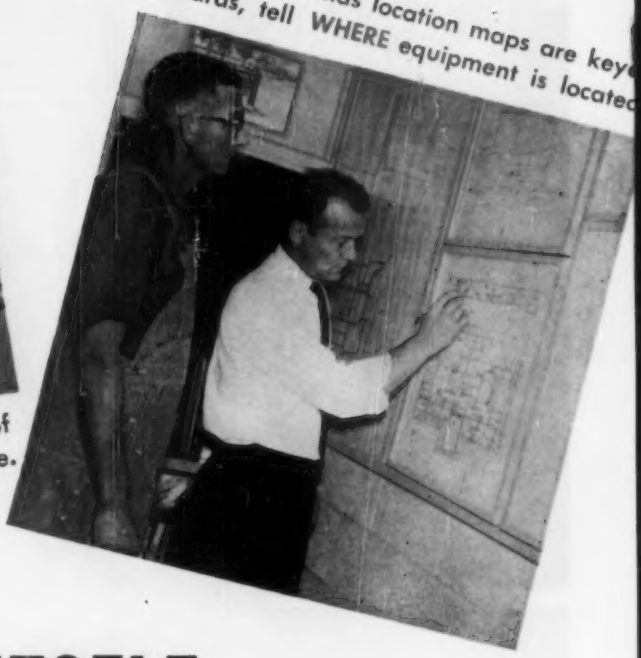
Who should do the work is shown by the color of a star placed on the job-assignment card (shown at top of page, left).

Blue, gold, or red stars indicate whether job is for mechanic of highest skill, lesser skill, or labor. A blue-star man, for example, takes care of material handling and heating and ventilating equipment. Care of fire protection, pipelines, and parts of building is a gold-star job. Red stars cover some building maintenance and all grounds maintenance.

The card itself is the key to the successful operation of the program. The form is 4x7 inches. It's standard time-card size, yet contains everything the supervisor and the mechanic need to know about any and every maintenance duty. There are about 200 permanent cards in use at B-W.

When jobs are to be done is shown by placement of each card on a series of standard time-card racks —that hold all job-assignment cards. The racks are divided into vertical rows, labeled *daily, weekly, bi-monthly, monthly,* and *three, six,* and *twelve months.* Cards are placed in the appropriate vertical row based on frequency of maintenance.

On back of job-assignment cards is a list of operations, telling WHAT must be done.



Floor and grounds location maps are keyed to cards, tell WHERE equipment is located

ALMOST RUNS ITSELF

The board is also divided horizontally (near the center) by a heavy red line. All cards above the line are jobs waiting to be done. All cards below the line are completed jobs. Maintenance men simply take cards from above the line, do the work, then replace them in the racks below the line. They mark date and time "in" and "out" on reverse side, and note any special trouble or unusual action.

At the end of any maintenance period (each day, week, month, etc., depending on maintenance frequency), the clerk moves all cards from below the line to a slot above the line, signaling that the work is to be done again. To avoid the danger of loss of any cards the clerk checks weekly the entire panel for each category against a summary index card. This card lists all jobs (by title) in each category. It's kept in the "Index" column at the extreme right of the board. As a further precaution, master copies of all index cards and all individual cards are kept on file.

What's to be done is listed right on the cards. And for basic reference, devising job instructions or detailed instructions for new men or infrequent jobs, B-W has a complete, color-coded file system that works this way:

Job-assignment cards come in nine colors. Each maintenance function is identified by a different color, which is used on file tabs and elsewhere throughout the program for quick identification of the type of equipment on which work is to be done. The nine functions at B-W are: (1) material handling—yellow; (2) exhaust systems—blue; (3) heating and ventilating—pink; (4) building maintenance—gray; (5) grounds maintenance—brown; (6) water pipelines, all kinds—green; (7) air lines—gold; (8) electrical—orange; (9) fire protection—red.

The color-code system is carried out in the equipment record file, where detailed data on all B-W equipment are kept—installation and operating manuals, parts lists, catalogs, and checklists. The drawer file is divided by function, and color-coded to match the cards.

A separate folder holds all data for each type or make of equipment. For example, every group of different make in the heating and ventilating system is in a separate folder. But each has the same pink-colored tab representing that function.

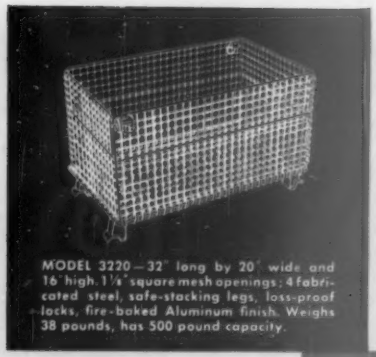
Where the job is to be done is shown on a code linked to one of five floor-location charts.

First chart is a plot plan of the entire property. This divides the plant into easily distinguishable areas—there are 117 now. Purpose is to identify all equipment by area code numbers.

How does the card tell where the job is? For example, AF-60-1 on the card means there is an air filter in area No. 60, and that it's the first one to be installed there. If more filters are added, the consecutive numbers are applied. Thus the ninth air filter in area No. 60 is identified as AF-60-9.

When possible, numbers are marked on equipment.

Turn the page


MODEL 3220—32" long by 20" wide and 16" high. 1⅛" square mesh openings; 4 fabricated steel, safe-stacking legs, loss-proof locks, fire-baked Aluminum finish. Weighs 38 pounds, has 500 pound capacity.

FOLD-DOWN FEATURE—Both Model 3220 and 3220SGC fold down quickly and easily to save over 75% of the open area. This feature saves storage space, makes handling easier and lowers return shipping costs.

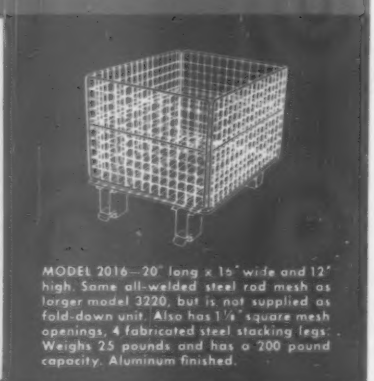
And now... the new 'JUNIOR' PALLETAINERS®

The new 'Junior' Palletainer models are sturdy, close-meshed, all-steel containers designed for more efficient handling, storage, protection and safe transit of any small parts. Ruggedly built of reinforced, welded steel rod mesh, the 'Juniors' incorporate many of the outstanding construction and convenience features found only on the larger, heavy duty Palletainers.

Check your plant today—see how many places the 'Juniors' could smooth production, speed processing and save valuable handling time.

SPECIAL OFFER ... Try these tested, proved-in-service containers on a 60-day memo billing basis. Your obligation is freight, only. Do it today!

MODEL 3220SGC WITH SIDE GATE—Dimensions of the model 3220SGC are the same as those of the regular 3220 model except that this unit is equipped with a hinged, Type "C" side gate for quick, easy access. Use of side gate does not affect stackability or safety.


MODEL 2016—20" long x 15" wide and 12" high. Same all-welded steel rod mesh as larger model 3220, but is not supplied as fold-down unit. Also has 1⅛" square mesh openings, 4 fabricated steel stacking legs. Weighs 25 pounds and has a 200 pound capacity. Aluminum finished.

USP
UNION STEEL PRODUCTS CO.
818 N. BERRIEN STREET
ALBION, MICHIGAN

MAINTENANCE SYSTEM

Begins on page 176

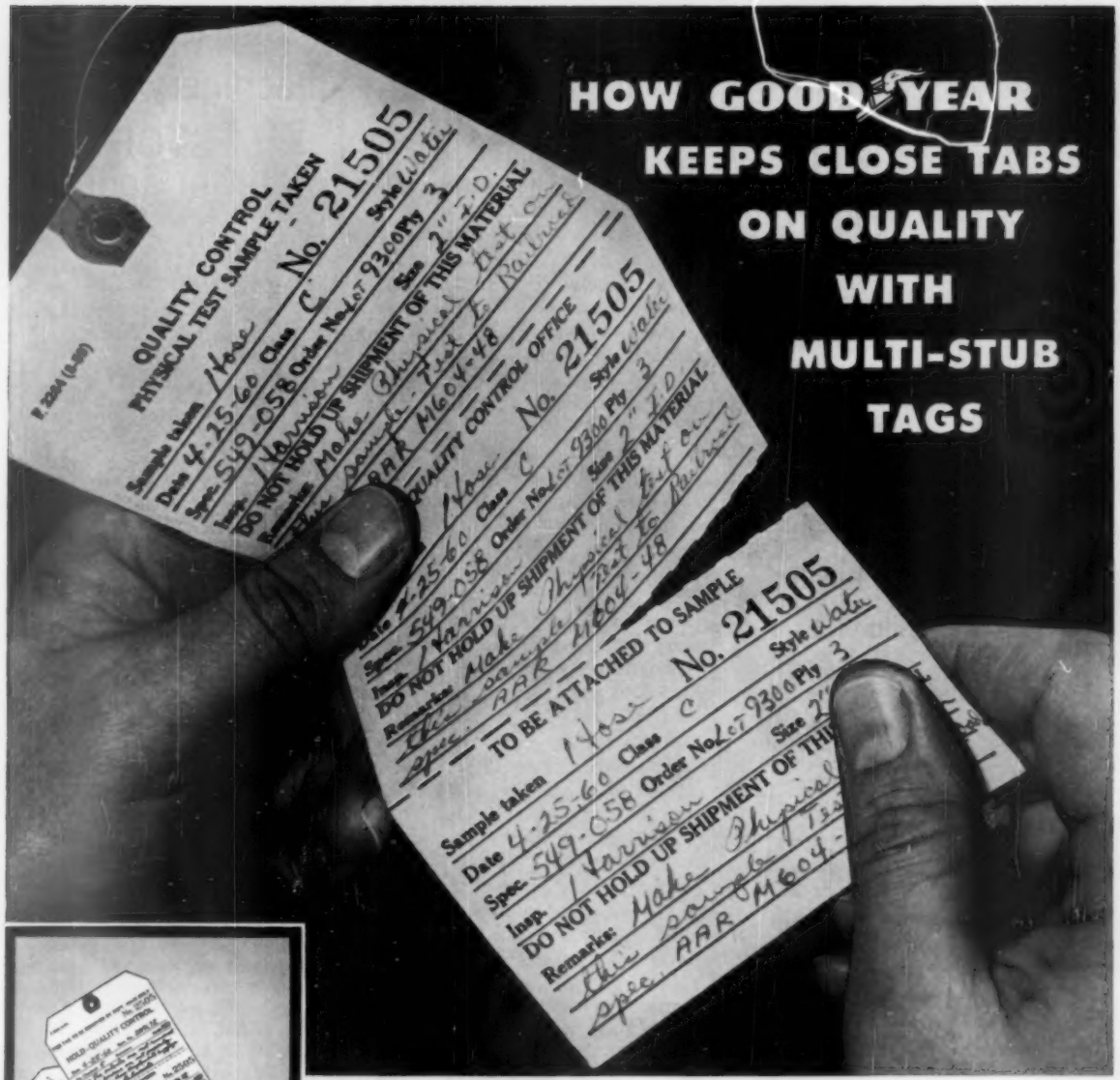
The other four charts also show the full property plot plan, but each is limited to location of specific facilities. One chart shows all heating and air-conditioning systems—unit heaters, air and exhaust ducts, pumps, fans, thermostats. Another shows all elements of the electrical distribution system—transformers, generators, bus duct, switchboards. A third shows all pipeline systems. Fourth gives location of items such as fire extinguishers, fire doors, watchman stations, stairways, and cranes. Anything that needs maintenance appears on one of the equipment location charts, marked with the same code that is on the card.

HELP FOR THE MANAGER

The maintenance manager can play a lot of tunes with this program, in addition to efficient scheduling. Here are some:

- **Simplifies training of new men**—The location charts and the specific instructions on each job card are valuable training aids.
- **Sets time allowance for each job**—This is shown in box in upper right corner of card. From these allowances you can figure total work load and manpower needs.
- **Gives record of work performance**—Spot-checks are made of actual time against time allowance.
- **Assures proper lubrication**—Requirements are incorporated in job instructions.
- **Depicts status of work load**—A quick look at cards above and below the red line on the scheduling board tells the story.
- **Gets cost information**—The cards are an aid in charging maintenance costs to proper accounts.
- **Maintains safe equipment**—Routine inspections include all necessary safety inspections of equipment like ladders and sling chains.
- **Promotes corrective maintenance**—Entries of mechanics are studied to see if any work can be avoided by changing part or process.
- **Controls supplies inventory**—The program also includes (to the left of the scheduling board) a dual rack labeled "Maintenance Supplies." Here a color-coded card is kept for each of the various supplies needed

HOW GOODYEAR KEEPS CLOSE TABS ON QUALITY WITH MULTI-STUB TAGS


QUALITY CONTROL
PHYSICAL TEST SAMPLE TAKEN
No. 21505
Sample taken
Date 4-25-60 Class C Style Wate
Spec. 549-058 Order No. Lot 9300 Ply 3
Insp. Harrison Size 2" I.D.
DO NOT HOLD UP SHIPMENT OF THIS MATERIAL
Remarks: Make Physical Test on
This sample - Test to Railroad
Spec. AAR M604-48
TO BE ATTACHED TO SAMPLE

These three Dennison-produced tags are quality control tools at the Goodyear Tire & Rubber Company, Akron, Ohio. One has 12 stubs that control hose production and wage payments as well as 100% inspection. The other two have 3 stubs for initiating sample tests and for following through afterwards. These hard-working tags are typical of the dozens of wisely planned tag forms used by Goodyear. Together, they systematize work progress from receipt of crude rubber to shipment of hose, tires, conveyor belts and other quality-controlled products of "The Greatest Name in Rubber".

Multi-stub tags simplify systems at lowest practical cost when Dennison becomes your paperwork partner. Your tag forms cover vital information in the most orderly way . . . as you'd expect from America's first and largest source of patched tags. And, because Dennison-designed automatic machines integrate clear printing, strong patching, clean die-cutting and sharp perforating in a single high-speed sequence, Dennison delivers highest quality at lowest cost.

A free analysis of your tag systems with design suggestions and cost quotations is yours for the asking. Benefit from the longest experience in system-mating tags by contacting Dennison first.

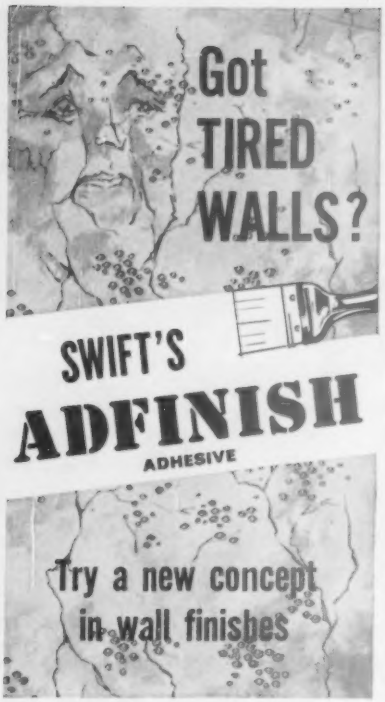
Dennison

Helping you compete more effectively

FRAMINGHAM, MASSACHUSETTS

Sales offices in principal cities

For more facts Circle 472 on Reader Service Card



Now you can finish new masonry or *refinish* old masonry with a *brush-on*, easy-to-use, fire-retardant adhesive finish that is chemical, moisture, and vermin resistant.

Swift's ADFINISH comes in three colors: Brilliant White, Bright Yellow, and Pearl Gray. Use it to brighten dry, damp and dingy walls:

Finish damp masonry surfaces

Impart moisture resistance to concrete block

Refinish concrete surfaces

Brush over brick and stucco

Return the coupon for details. Ask about ADCOTE for trowel application.

Swift

AD-10

JUST CLIP TO LETTERHEAD AND MAIL

105TH YEAR

Swift & Company
Adhesive Products Department
Chicago 9, Illinois

☐ Send bulletins on ADFINISH
☐ Send information on trial order
☐ Send details on ADCOTE

Name_____

180 Circle 473 on Reader Service Card

MAINTENANCE SYSTEM

Begins on page 176

for the job cards. It records inventory—by adding receipts and subtracting weekly usage—and shows re-ordering point.

• **Minimizes material inventories**—Case in point is the job card for group relamping. It instructs clerk when to order new lamps.

• **Adjusts easily to operating changes**—Frequencies are based on normal operations. If a protracted operating change is in view, cards can be temporarily adjusted by an easy erasure, without retyping.

• **Adjusts easily to equipment changes**—Changes in any plot plans are made promptly in wax crayon on clear plastic sheets that cover the plans, until new plans are printed. New equipment can be easily slotted into schedule, to preserve a balanced work load for the department.

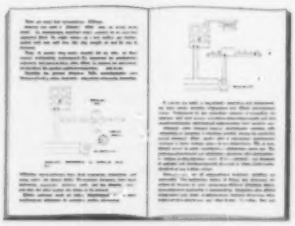
• **Controls special jobs**—Unscheduled jobs (new or repair) are handled by factory orders. Each order is represented by a color-coded card that is kept in a set of racks to the left of the schedule, labeled "Factory Orders, In and Out." This visual display allows the maintenance head to ride herd on the execution of these special jobs.

• **Provides cost control**—The code numbers for material and labor in upper left corner of the job card are applied by mechanics to material requisitions and weekly job-time cards. From regular accounting cost summaries the maintenance head can check any abnormality.

• **Stimulates constant research for improvement**—A third set of racks at extreme left of the schedule board, labeled "Research and Development," records projects aimed at cutting costs. For example, Hill was impressed by the high maintenance cost of throwaway filters on air-conditioning units. He set up a pink card in the R&D rack, and research showed that permanent washable filters, at three times the original cost, needed service only every three months. Result: New filters were purchased. The corresponding pink card in the scheduling section was then revised and shifted from "monthly" to "3-month" frequency. In this way, the R&D rack prods the maintenance head into cost improvement action. **END**

END
machinery damage
STOP
material spoilage!

. . . This free book tells you how!



Now you can end the threat of sudden equipment breakdowns, production stoppages, ruined material — easily and inexpensively. With a simple load control on your equipment, even the slightest hint of overload or jam-up is caught in ample time to prevent damage, wear, or interruption.

An easily-installed Mek standard load control senses the telltale deviations in motor input current that warn of impending overload damage . . . excess speed, pressure, or torque . . . or human error. Responding instantly to protect machinery, tools, dies, and material, the low-cost Mek control triggers any desired reaction: *stop, reverse, trip, signal, or recycle.*

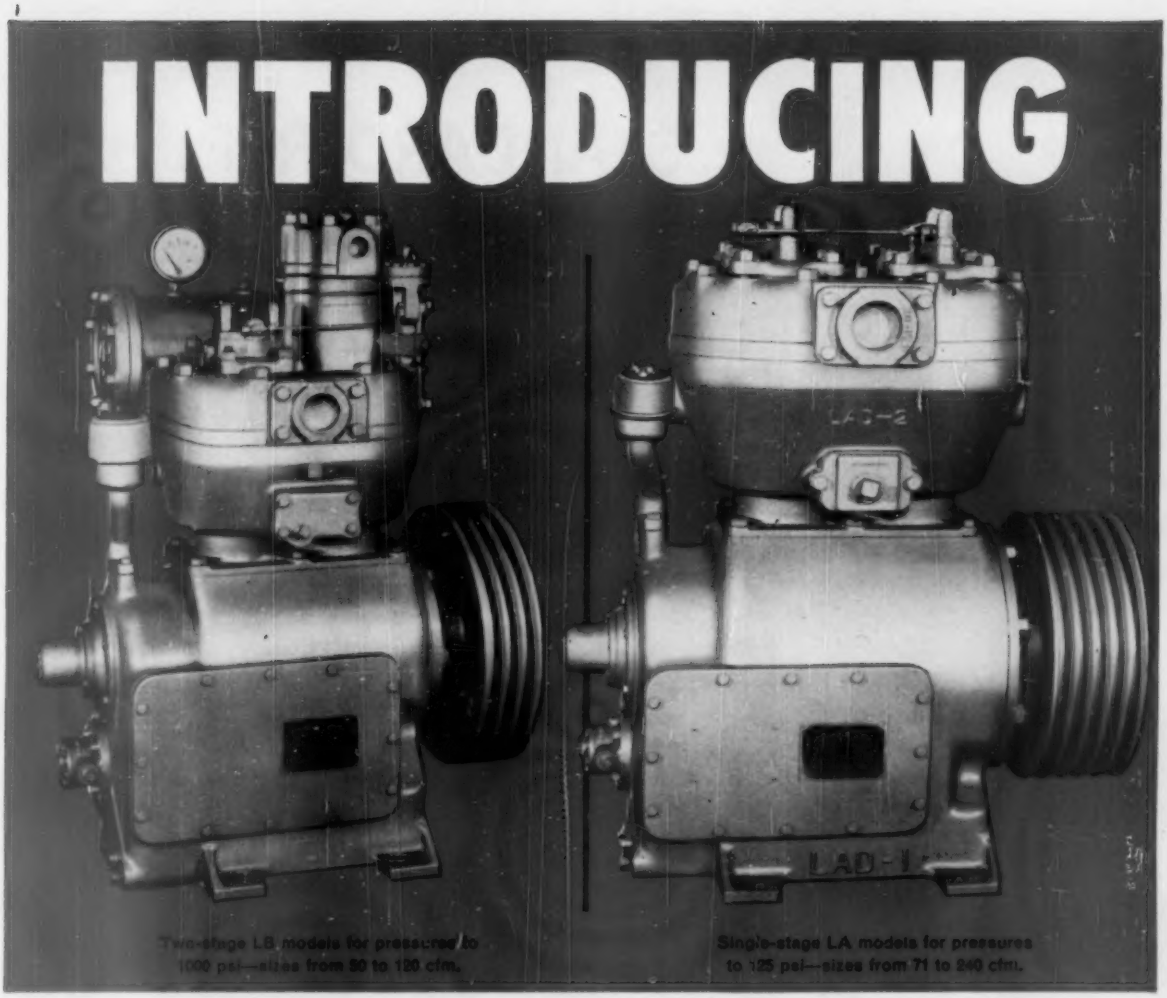
With a Mek load control, you can establish end-points to control crushing, grinding, polishing, or mixing operations. You can safely increase machine loads and production rates without risk of exceeding equipment limits. You can automatically regulate material feed rates, tool-to-work force, conveyor operation — easily automate and protect hundreds of mechanical functions now dependent on human alertness.

Send today for free illustrated book and learn how Mek load controls are safeguarding production machinery and preventing material spoilage in hundreds of plants from metalworking to food processing.

MEK
Machinery
Electrification, Inc.
60 Hudson St., Northboro, Mass.

Circle 474 on Reader Service Card

INTRODUCING



Two-stage LB models for pressures to 1000 psi—sizes from 50 to 120 cfm.

Single-stage LA models for pressures to 125 psi—sizes from 71 to 240 cfm.

a new line of heavy-duty
GARDNER-DENVER COMPRESSORS

50 to 240 cfm piston displacement

Here are two new, compact Gardner-Denver air compressors designed for new efficiency and durability. Engineered interchangeability simplifies parts stocking. Built for years of continuous service, they require *only* routine maintenance.

Check these improved design features

NEW water-cooling design—gives more efficient use of power.

NEW positive pressure lubrication system to main bearings and connecting rods.

NEW bearings—adjustable, tapered roller bearings.

NEW aluminum pistons—lighter mass to start and stop . . . conserve power.

PLUS all the quality engineering you've been used to in Gardner-Denver compressors for nearly 100 years.

Get the complete story on these new compressors from your Gardner-Denver representative or write for Bulletin LA-1.

EQUIPMENT TODAY FOR THE CHALLENGE OF TOMORROW

GARDNER - DENVER

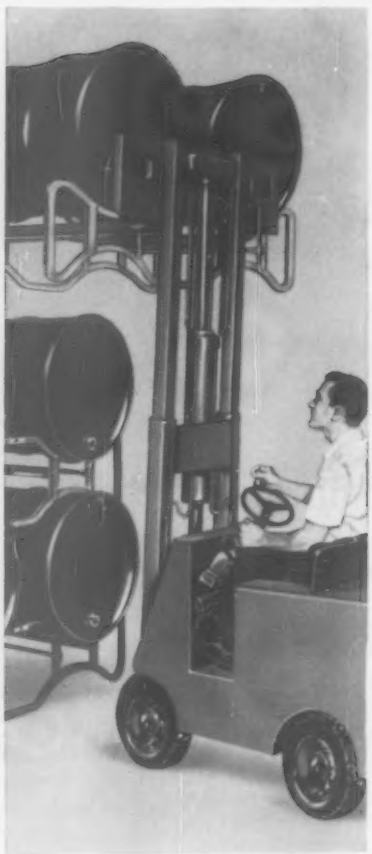
Gardner-Denver Company, Quincy, Illinois

In Canada: Gardner-Denver Company (Canada), Ltd., 14 Curity Ave., Toronto 16, Ontario

For more facts Circle 475 on Reader Service Card

STANDARD REPUBLIC MATERIALS HANDLING PRODUCTS SIMPLIFY CONTAINERIZATON

REPUBLIC WEDGE-LOCK® PARTS STORAGE UNITS are easy to load or unload from either side. And, the heavier the load, the tighter the grip, because patented Wedge-Lock construction includes a post that will not buckle; a concealed sway-proof joint, and a reinforced shelf that does not sag. Unlimited shelf arrangements. Capable of exceptionally high stacking. Republic Storage Engineering specialists will help you plan.



NEW REPUBLIC DRUM RACKS assure stacking of more in-use drums in less space and at lower cost than ever before. Each rack supports two loaded 55-gallon drums. Racks with drums can be stacked to any practical height. Standard fork-lift trucks can pick, move, and stack as many tiers of drums at one time as capacity permits. Shipped knocked down, with fasteners for quick and easy assembly.

REPUBLIC PB-127 COLLAPSIBLE BOXES lower the cost of storage or shipment of empty stacking boxes. Heavy-duty corrugated design delivers long, efficient service at lowest per-year cost. Boxes can be tiered when loaded or empty, collapsed or set up. All parts permanently attached. Ideally suited to shipping castings and other heavy items, the PB-127 Box offers up to 66% savings in storage space.

This STEELMARK of the American Steel Industry tells you a product is made of Steel. Look for it when you buy.

Moving raw materials through production lines to shipping is faster, easier, more economical, with standard Republic Materials Handling Units . . . key to *containerization.*

Strong, sturdy, Republic Units are designed and produced to withstand abuse of everyday, workday service. Many special materials handling problems can be solved from Republic's full line of standard units, at big savings for you.

Let the materials handling engineers of Republic's Berger Division work with you in solving your materials handling problems. Call your Republic-Berger representative, or write direct.

REPUBLIC STEEL

DEPT. FA-8877-A • 1441 REPUBLIC BUILDING • CLEVELAND 1, OHIO

For more facts circle 476 for storage units, 477 for drum racks, 478 for collapsible boxes

FACTORY CATALOG NEWS

For more about these items, circle numbers on Reader Service Card next to back cover.

PRODUCTION

1—Welding. Stainless-steel welding is treated in newly revised 24-page manual. Outlines commonly-used steels and various welding procedures. Types of electrodes and wires are covered in question-and-answer form. *The McKay Co.*

2—Lathes. Here's a folder of three brochures (34 pages in all) that describe models with same basic bridge-bed design. Drives, slides, tracing and other units, can be adapted to suit individual needs. *Jones & Lamson Machine Co.*

3—Die Casting Machines. This 12-pager presents line of high-pressure hydraulic machines. 7 models: 100 to 2000 tons. Includes details on optional features like machine automation and vacuum die casting. *Cleveland Automatic Machine Co.*

4—Presses. Machinery to cut off roll-formed shapes on the fly is the subject of this 8-page bulletin. Discusses flag-type and positive-stop types of measuring, press speeds and accuracy. Application photographs. *Federal Press Co.*

5—Welder Carriage. The Squirtmobile is a magnetically supported trackless carriage for the Squirt welder. Bulletin No. 5205.2 (4 pages) tells how it provides accurate control of welding procedures. Drawings show construction details. Photos. *Lincoln Electric Co.*

6—End Mills. This 124-pager (No. 60) lists 1800 sizes and types of end mills. Has pictorial tool selector, and two indexes for easy reference. Catalog is spiral-bound and fits in tool box (5½x8 in.). Photos. *Putnam Tool Co.*

7—Lathe. New model heavy-duty engine lathe is described in 12-page bulletin (No. S-604). 75 usable hp., 36 spindle speeds, 180-cu.-in.-per-minute removal rate, simplified controls. Specifications and other data. *Sidney Machine Tool Co.*

8—Inserting Tool. Miniature power tool is the subject of Bulletin 770A (4 pages). Flexible drive shaft from remote motor and limited size of inserts cut weight. Automatic clutch, precision-depth adjustment. *Heli-Coil Corp.*

9—Microstoning. Complete information on this process is given in 18-page Catalog 319. Technique uses oscillating polishing or abrading stones for controlled microinch finishes while correcting imperfections. *Taft-Peirce Mfg. Co.*

10—Punches, Dies. Regular, medium, and long lengths in Ring and head-type punches are described in 48-page catalog. Includes handy "picture page finder." Specifications, material and heat-treating data. *The Producto Machine Co.*

MAINTENANCE

11—Lubricating Gun. This 6-page bulletin tells all about the lightweight, portable (53 lbs.) Hypregun. For large scale valve lubrication, it has a 100:1 pressure ratio and double-action piston. Cutaway drawings. *Rockwell Mfg. Co.*

12—Impact Tool. The Air Impactool is the subject of this 4-pager. Its light weight (33 lbs. without socket) enables one man to use it. 75% faster rundown claimed. Average rate of 700 impacts per minute at 90 psi. *Ingersoll-Rand Co.*

13—Spacer. Brochure No. 8-659 (4 pages) describes universal-type spiral spacer used in joining crushable panels to other parts or panels. Cross section drawings and illustrations cover installation, required tools. *Huck Mfg. Co.*

14—Wear Strip. Here's a 6-pager that discusses self-lubricating, hardwood wear strip. Fabricated to specifications. May be attached at chain return drop-off points following curvature of original ways. *Paramount Oilless Bearing Co., Inc.*

MECHANICAL

15—Transmission. Roto-mission, a differential planetary gear transmission, is the subject of this 8-page bulletin (IR-60). Capacities from fractional to 60 hp. Up to 270 to 1 speed reduction. *Airborne Accessories Corp.*

16—Couplings. This 20-pager (Bulletin 901) describes two new types of flexible cushion couplings. One for high speed, high torque application, and one for attachment to flywheels of internal combustion engines. *Dodge Mfg. Corp.*

17—Sheaves. Catalog section (83-A) lists 410 stock sheave sizes (quick-demountable type). One manufacturer's attempt to comply with V-drive industry program to simplify variety of sheave sizes in stock. *Fort Worth Steel & Machinery Co.*

18—Drives. Catalog PD-1 (48 pages) deals with the Maurey positive drive. Available in five stock pitches. Fractional to 600 hp. capacity range. Includes construction and selection details, drive tables, ratings. *Maurey Mfg. Corp.*

19—Sprockets. Specification guide (Catalog Section 320, 36 pages) describes maker's roller-chain drive line. Sprockets come in 1013 sizes. Drive selection, sprocket mounting, lubrication, and other data. *Fort Worth Steel & Machinery Co.*

20—Transmission. A compact automatic transmission is the subject of this 8-pager. Primarily for small (1-25 hp.) engines, it can be adapted as constant speed regulator. Outlines application, installation, maintenance. *Morse Chain Co.*

21—Hydraulic Products. Here's a 74-page catalog (5001C) that describes power packages, servo valves and systems, vane and piston pumps, flow controls and assemblies, accessories. Specifications, tables, curves, etc. *Vickers Inc.*

Turn the page

Spang Steel Pipe provides all piping services in Detroit's new $4,500,000 Greyhound Bus Terminal.

SPANG® Steel Pipe uniformity pays off in Greyhound Terminal Installation

All the steam heating, air conditioning, plumbing, natural gas and storm drainage facilities in Detroit's new Greyhound Bus Terminal Building are serviced by SPANG Steel Pipe in sizes ranging from ¾" to 8". SPANG offered many advantages during installation. Listen to what Vice President George H. Whybrew of James & Roach, mechanical contractors, said about it.

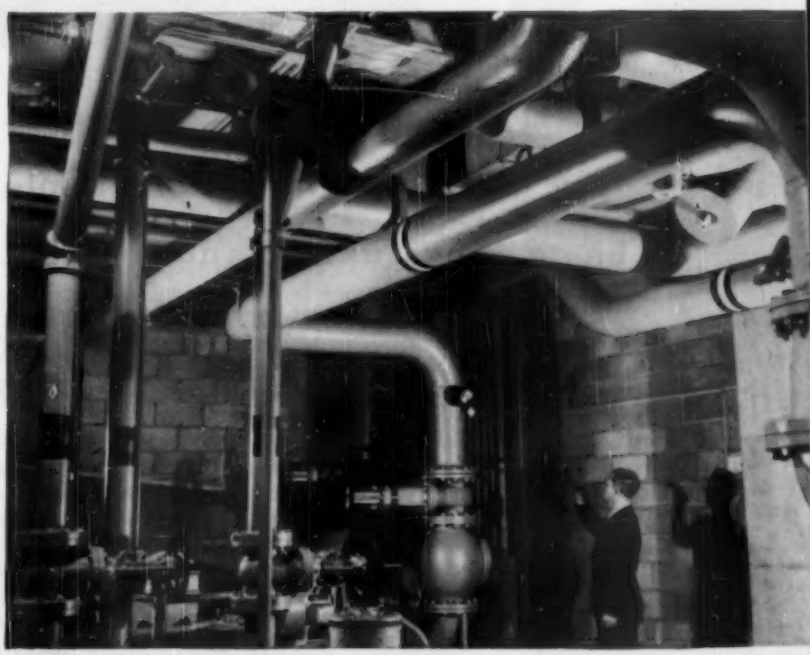
REPORT FROM MECHANICAL CONTRACTOR

"We had excellent delivery service on SPANG, getting what we needed when we needed it with no delay. And we got a good product. Our pipe had been hydrostatically tested at pressures many times our highest requirements.

"On actual installation, the consistent uniformity of SPANG Pipe was important in saving us time. We had some severe bends to do, but the pipe held up beautifully—no kinking, flaking or cracking. End cuts and bevels were true, and welding was no problem. In exposed locations, the smooth exterior finish painted nicely and made a good appearance. Yes, I'd recommend SPANG without hesitation on the basis of this job alone!"

GET DEPENDABLE PERFORMANCE WITH SPANG

Mr. Whybrew is just one of many contractors who know they can count on SPANG's uniformity for top-quality installations. SPANG can help you, too. Next job, be sure to ask for SPANG Steel Pipe . . . made in U.S.A. Call your nearby SPANG Distributor for service.



Steel's Symbol of strength, long life, and economy

In exposed locations, Spang's smooth exterior provides neat appearance. Spang Pipe uniformity and good service helped speed this job's construction.

SPANG CW STEEL PIPE

THE NATIONAL SUPPLY COMPANY

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Subsidiary of Armco Steel Corporation

For more facts Circle 479 on Reader Service Card

Owner: Eastern Greyhound Lines, Division of the Greyhound Corporation, Cleveland, Ohio
Architect: Arrasmith and Tyler, Louisville, Kentucky
General Contractor: Bryant and Detwiler, Detroit 26, Michigan
Mechanical Contractor: James & Roach, Detroit, Michigan
Engineer: Southern Engineering Corporation, Louisville, Ky.
Spang Distributor: O'Connell Supply Company, Dearborn Mich.

Mr. R. A. Weaver, Electrical Superintendent, Dole Hawaiian Pineapple Company states: **"On the basis of evaluation and comparison with other drives . . . We found General Electric Polydyne® Drives best meet our adjustable-speed requirements."**

At Dole Hawaiian Pineapple Company's Honolulu Cannery, "Ginaca" processing machines can automatically reduce whole pineapples into separate "components" of core, rind, pulp and a cylinder ready for final processing at a rate of up to 6000 per hour. With a constant-speed motor drive it is necessary to stop and start a Ginaca to control output. However, the Polydyne Drive can match the varying conditions at each stage of the processing system. The adaptability of Polydyne Drives reduces the need for supervisory attention and permits maximum processing efficiency.

Dole Company personnel selected General Electric's Polydyne Drives for the quick and smooth response to speed adjustments demanded by their continuous processing system. As Mr. Weaver also commented, "In our evaluations and comparisons with other drives we gave particular attention to ease of belt replacement because this makes maintenance simple and reduces downtime. We found Polydyne Drives far superior to other drives for making belt changes quickly."

When your application requires low-cost adjustable speed combined with reliability and ease of maintenance, investigate G-E Polydyne Drives. Your General Electric Sales Engineer has full details. Or, write for bulletin GEA-6806, Section 854-05, General Electric Company, Schenectady 5, N. Y.

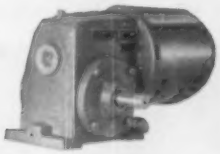
GENERAL ELECTRIC

GENERAL ELECTRIC OFFERS A *COMPLETE* LINE OF LOW-SPEED DRIVES 1/8 TO 200 HP

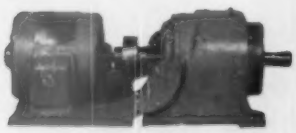
Select from G.E.'s PLUS LINE of compact mechanical power transmission equipment! A full range of ratings is available—many directly from stock.

General Electric Polydyne Drive

Integral-type Gear Motor

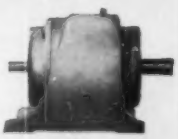


Right-angle Shaft Gear Motor



All-motor Gear Motor

Footed Speed Reducer



Shaft-mounted Speed Reducer

Member of American Gear Manufacturers' Association

GENERAL ELECTRIC

FACTORY / CATALOG NEWS . . . *Begins on page 184*

For more about these items, circle numbers on Reader Service Card next to back cover.

ELECTRICAL

22—Circuit Protection. Here's a bulletin that describes low-voltage (600 v.) circuit protection. Loadmaster 100 is an interrupter switch that employs dual-element fuse and a minimum of mechanisms to cause trouble in harmful atmospheres. *McGraw-Edison Co.*

23—Induction Motor. Squirrel cage motors in basic dripproof designs are covered in this 12-page bulletin. Ranges from 1 to 150 hp. Gives performance characteristics, design variations, construction details. *Century Electric Co.*

24—Variable Transformers. Here's a 10-page reference guide to electronic/electrical products. Covers ratings and technical data on variable transformers, voltage regulators, connectors, synchronous motors. *Superior Electric Co.*

25—Raceway Systems. This illustrated 12-pager contains complete engineering data on surface wiring raceway systems. Includes specifications, wire capacities, installation instructions, available tools, and fittings. *The Wiremold Co.*

26—Precision Switches. Catalog No. 10-1 (32 pages) presents information on maker's expanded line of snap-acting precision switches. Technical data is supplemented by "how to choose" section and definitions of terms. *W. L. Maxson Corp.*

27—Circuit Breakers. An easy-to-use index is featured in this extensive product guide. Fusible and circuit-breaker devices are divided into eight main groups which include troughs and enclosures. *Wadsworth Electric Mfg. Co., Inc.*

28—Power Systems. "Better Power for Production" is the title of this useful 48-page bulletin (GEA-7139). Includes how to choose voltages, short circuit calculations, protective relaying, grounding, other details. *General Electric Co.*

29—Distribution Systems. 32-pager (Bulletin No. 80) describes trolley busway electrical distribution systems. Applications: electrification of cranes and hoists, machine tools, conveyor assembly lines, etc. *Feedrail Corp.*

AUXILIARY

30—Pumps. Descriptive and performance data are included in this 12-page catalog of diffusion and booster pumps. Sizes from 1 to 32 in. Information on theory of diffusion pumps and their operation at very low pressures. *NRC Equipment Corp.*

31—Tank Heaters. Bulletin 300 (8 pages) lists tank heaters into three general types: vertically mounted, horizontally mounted, and immersion. Gives specification, installation data. *Brown Fintube Co.*

32—Water Tanks. This 20-pager describes design and function of elevated steel tanks for water storage. Emphasis on spheroidal, radial cone, ellipsoidal designs. Capacities: 15,000 to 3,000,000 gal. *Chicago Bridge & Iron Co.*

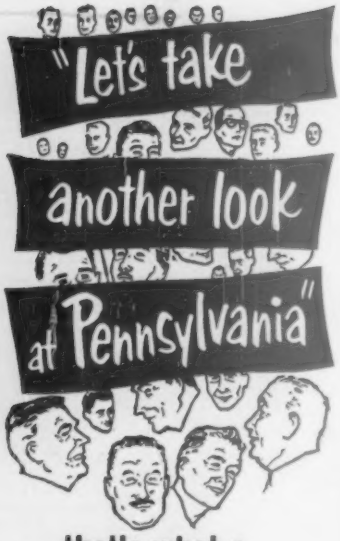
33—Boilers. Bulletin No. AA2760 (16 pages) illustrates new line of Amesteam generators. 20- to 600-hp. range, fully automatic; 3-pass concentric tube design. Includes analysis of boiler design factors, other data. *Ames Iron Works Inc.*

34—Heating Elements. Thin Band heaters for rapid heat transmission are the subject of a 4-page bulletin (BHA). Covers mounting, clamping styles, terminals. Applications on wide range of circular containers. *ACRA Electric Corp.*

35—Filters. New compressed air filters, described in Catalog 6000 (8 pages), are used with air-operated equipment and for cleaning of air used in processing. Disposable scrubber and polisher cartridges last for months. *King Engineering Co.*

Turn the page

◀ For more facts Circle 480 on Reader Service Card



...that's what a growing number of industrial executives are saying and doing!

In the past four years they announced:

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(Send for the list—address below)

They are finding:

Surplus of industry-minded workers . . . Strategic locations in the great Eastern market with access to major trunk line railroads, and modern highway and Turnpike networks . . . Ports on the Atlantic, St. Lawrence Seaway and Ohio River system . . . All types of industrial raw materials and components . . . 100% low-interest plant financing in labor surplus areas . . . Choice of industrial "parks" and individual plant sites.

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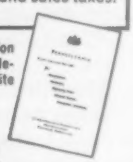
For free copy of "Plant Location Services" pamphlet, or for details on 100% financing, write or call:



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188 Circle 481 on Reader Service Card

FACTORY / CATALOG NEWS

Begins on page 184

For more about these items, circle item numbers on Reader Service Card next to back cover.

36—Telephone Systems. Here's a 6-pager that shows how executives can reach as many as 3200 persons with Dial Flexifone. Describes features of intercom equipment and private automatic phones in one desk instrument. *DuKane Corp.*

MATERIAL HANDLING

37—Casters. This useful 75-page buying aid compares these casters with those of other makes. Dimensional charts list every model (12,000) and its physical characteristics. Includes information on other equipment. *The Colson Corp.*

38—Bins. "Tote, a Complete System to Solve Your Bulk Material Handling Problems" is a well-illustrated booklet. Describes filling, discharging, storing, other applications. *Tote System, Inc.*

39—Screw Conveyors. Bulletin 83-A (8 pages) describes maker's line of standard and industrial gas-tight screw conveyors. Includes conveyor boxes and covers, hangers, box-ends, discharge openings. Photos. *Sprout, Waldron & Co., Inc.*

40—Slings. Information about nylon and Dacron slings in this 4-pager (AD-605) includes data showing resistance to all common agents. Dimensions, capacities of slings in vertical, choker, basket applications. *Jones & Laughlin Steel Corp.*

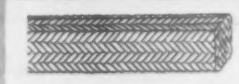
41—Packaging. This 8-page folder uses photographs to describe maker's line of packaging methods. Shows pallet, skid and fiber board boxes; rim drums; spools and reels; stake skids. Data on handling and storage problems. *Calumet & Hecla.*

42—Belting. Conveyor, elevator and transmission belting are discussed in this 36-page catalog. Includes specifications and cross section illustrations. Tables relate to weights, gauges and fabrics. *American Biltrite Rubber Co.*

Turn the page

FOR HIGH OR LOW SPEED ROTARY OR RECIPROCATING MOTION . . .

PALMETTO.
Interwoven Asbestos Packings



• For the ultimate in durable packing construction choose from the nine *interwoven* packings in the Palmetto Self-Lubricating Packing line . . . Combines density of braid over braid—flexibility of plaited. Send for your copy of SLP-659 that gives service conditions, applications, prices, etc.

GREENE, TWEED & CO.
NORTH WALES, PA.

Circle 482 on Reader Service Card

PLAN AHEAD with scale equipment

Better and quicker plant and office layouts are obtained by planning with models, as all variables can be seen. Models avoid mistakes in planning, show how to conserve space and labor, show up safety hazards, get quick decisions from management. Write for literature.

"VISUAL" PLANT LAYOUTS, INC.
PENNA. AVE. & RIVER
OAKMONT-ALLEGHENY COUNTY, PA.

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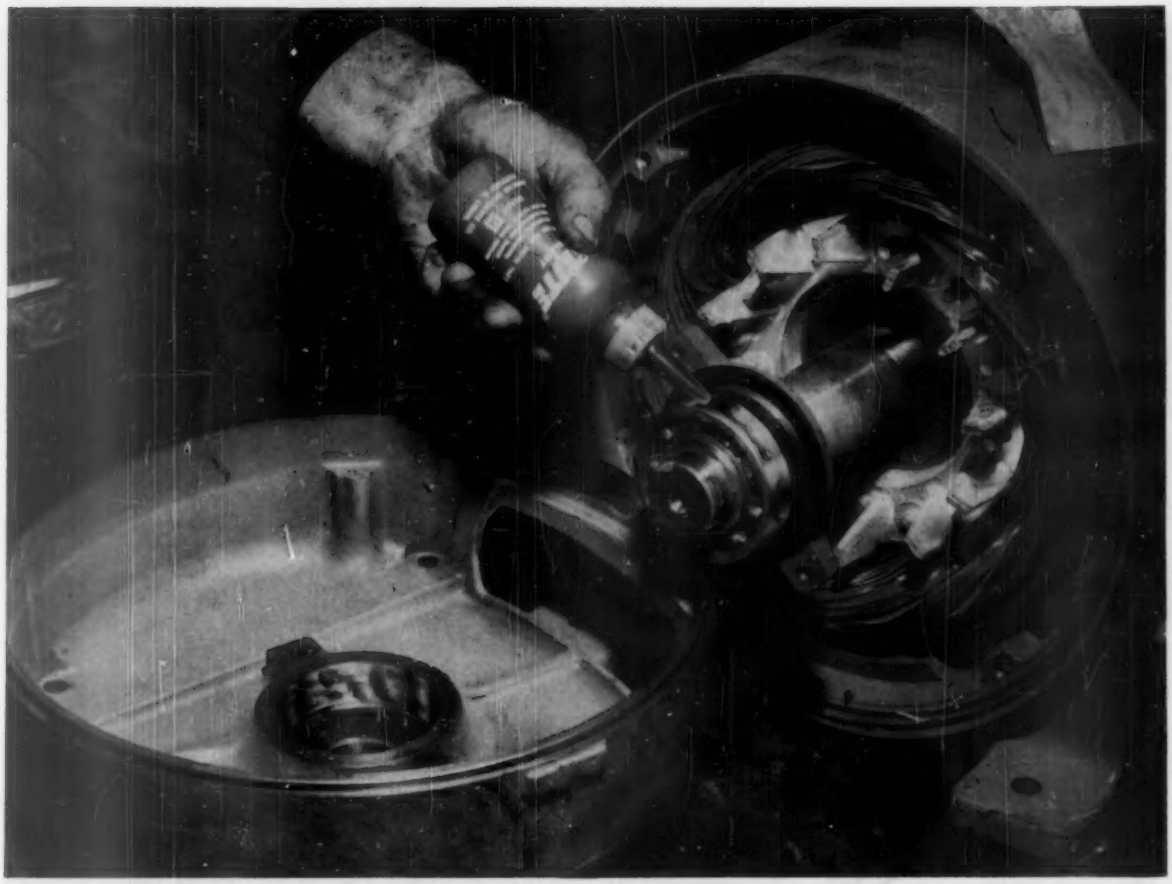


2¢ worth of Loctite restores end-bell bearing fits in minutes

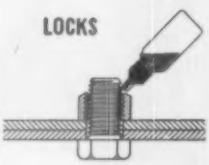
No longer need it be costly to maintain the fit between bearing and housing in electric motor end-bells. Loctite Sealant, the plastic that acts as a "liquid shim," has made the job a cinch.

Just a drop or two of Loctite on the bearing and the housing takes the place of these three common, but expensive, repair methods: (1) end-bell replacement, (2) boring out the housing, pressing in a steel sleeve, then machining the sleeve, (3) metalizing the housing, then machining.

Loctite is a thin liquid plastic with the unique property of hardening when confined between closely fitting metal parts. It comes ready-to-use, does not require mixing with a catalyst, and does not air dry. Bearings mounted with Loctite can be removed with ordinary bearing removal tools.

LOCTITE SEALANT—The Liquid Lock for Metal Parts has 1001 Uses

LOCKS

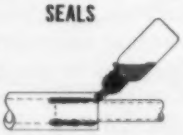


Stops costly breakdowns due to loose nuts and bolts. Makes any threaded part self-locking.

RETAINS

Repairs loose fitting bearings. Restores fit to worn housings and shafts. Makes bearing replacement easy.

SEALS



Seals joints pressure tight with tough plastic. No heating, no mixing, no pot life problems.

INDUSTRIAL DISTRIBUTORS · SERVING INDUSTRY ECONOMICALLY · THE RIGHT HAND OF PRODUCTION

You can count on your distributor salesman for service that keeps things running. Ask him for information on how to use Loctite to perform maintenance magic.

LOCTITE® SEALANT

AMERICAN SEALANTS COMPANY

391 NORTH MOUNTAIN ROAD, HARTFORD 11, CONN.

ELECTRIC IMPACT WRENCHES

KEEP PRODUCTION PEAKS HIGH ...MAINTENANCE COSTS LOW

CP-903-R Universal Electric Impact Wrench

The CP-903-R Universal Electric Impact Wrench will make your bolted assembly and maintenance jobs go faster and smoother. Here's why . . .

FAST, POWERFUL . . . 2000 blows per minute on bolt sizes up to ⅝".

HEAVY DUTY TOOL . . . Stands up to toughest use. Ball bearings throughout and helical gearing assure long life. Unitized motor stands vibration. Has box-type brush holders. Impact clutch prevents motor burnouts.

SAFE, EASY TO HANDLE . . . Safe, one-hand operation. Reversing snap interlock prevents accidental reversing while running.

VERSATILE . . . hurry-up call or general plant and equipment maintenance . . . the 903 does the job – plugs in anywhere. For further information, write: *Chicago Pneumatic Tool Company, 8 East 44th Street, New York 17, N. Y.*

Complete Kit 903-3M available in metal carrying case with Wrench, Hex Sockets, Jacobs Drill, Tap Chuck and Collets.

Chicago Pneumatic *8 East 44th Street, New York 17, N. Y.*

PNEUMATIC TOOLS • AIR COMPRESSORS • ELECTRIC TOOLS • HYDRAULIC TOOLS • VACUUM PUMPS • DIESEL ENGINES

For more facts Circle 485 on Reader Service Card

FACTORY / CATALOG NEWS

Begins on page 184

For more about these items, circle item numbers on Reader Service Card next to back cover.

43—Rings, Slings. Specifications, working load limits for line of alloy chain slings, rings, links, hooks are given in 16-pager. Explains how to use, maintain slings, attachments. 4-point inspection program. *Jones & Laughlin Steel Corp.*

44—Packaging. If you want some "Better Ways to Package, Unitize and Ship," this pocket-size 40-page catalog will be of interest. Strapping pointers; charts of shipping materials, equipment; data on methods, tools. *Signode Steel Strapping Co.*

PIPES AND VALVES

45—Couplings. Catalog No. 70 (12 pages) illustrates a variety of Dihedral spindle couplings. Gives engineering, capacity, dimensional data, and applications. Diagrams show couplings for various uses. Photos. *Ajax Flexible Coupling Co.*

46—Fittings, Flanges. Seamless welding fittings and carbon, alloy or stainless steel flanges are treated in this 8-page booklet (FB-502A). Includes breakdown of dimensional tolerances, size and type chart. *Babcock & Wilcox Co.*

47—Stainless Steel Tubing. This 8-page bulletin (110) is said to be first literature published on small diameter metal tubing for gas chromatography columns. Three types: standard capillary, miniature, packed. *Superior Tube Co.*

48—Clamps. Maker's line of clamps, couplings, flanges, and V-band joints are described in comprehensive 44-page catalog (No. 803). Wide selection offers "right" products for applications in maintenance, other fields. *Aeroquip Corp.*

49—Check Valves. Rugged construction and other features of machinery check valves are covered in 8 catalog sheets. Types include angle, in-line, gasket-mounting. *Parker-Hannifin Corp.*

Turn the page

THE
WEAKEST LINK
IN YOUR CHAIN OF
COMMAND IS YOUR
OUTSIDE
SWITCHBOARD

DuKane
strengthens your command with

PRIVATE AUTOMATIC TELEPHONE SYSTEMS

FAMOUS FLEXIFONE INTERCOMS

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A good executive can reach any employee, any time, *right now* . . . not through an outside switchboard, but via modern *internal* communication systems. With DuKane's famed Flexifone intercom, private automatic telephones, public or pocket paging (and other electronic wonders) *the man you want is always there!* Your chain of command is strong.

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DuKane sound and communication systems are installed and serviced by a nation-wide network of over 300 engineering distributors.

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Send me information on DuKane systems for strengthening our internal communications.

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HOW MUCH did your plant contribute to the $6 BILLION LOSS due to corrosion?

VALDURA VAL-CHEM COATINGS *STOP* costly corrosion

Your plant's share of the tremendous loss to corrosion last year could have been stopped with one of Valdura's Val-Chem chemically-resistant coatings. Remember—no one coating can solve all the problems. That's why Valdura offers you a *complete line* to fit every need—the new, field-tested Val-Chem Coatings. The assistance of Valdura's nationwide force of field representatives—experts in corrosion control—is at your service. How can Val-Chem Coatings stop corrosion in *your* plant? Write today on your letterhead for a prompt solution!

A-M VALDURA HEAVY DUTY PAINT DIVISION
AMERICAN-MARIETTA CO., CHICAGO 11, ILL.

For more facts Circle 487 on Reader Service Card

How to get drier or cooler AIR or GASES
at low cost

NIAGARA *AERO* AFTER COOLER cools a compressed gas, or air, below the temperature of the surrounding atmosphere, thus preventing the condensation of moisture in your lines. The gas will contain only half of the moisture left in it by conventional methods. Even drier gas can be produced if you require it.

In working with controlled atmospheres of inert gases to prevent undesired reactions, this dryness of the gas at low cost is a great advantage. The cost of the Niagara method is low because it uses evaporative cooling, saving 95% of the cost of cooling water (and its piping and pumping). This direct saving of cost pays for the Niagara cooler in less than two years.

If you use compressed air to operate instruments or pneumatic equipment you will get better results by using the Niagara Aero After Cooler.

Write for Bulletin 130, or ask nearest Niagara Engineer if you have a problem involving the industrial use of air.

NIAGARA BLOWER COMPANY
Dept. F-12, 405 Lexington Ave., New York 17, N. Y.
Niagara District Engineers in Principal Cities of U. S. and Canada

FACTORY / CATALOG NEWS

Begins on page 184

For more about these items, circle item numbers on Reader Service Card next to back cover.

50—Mechanical Tubing. Electric-resistance-welded carbon steel tubing is described in this 8-page booklet (T-549). Also explains production technique that uses ultrasonic inspection of the weld zone. Photos. *Babcock & Wilcox Co.*

51—Clamps, Fasteners. Catalog CF-60 (18-pages) presents maker's line. Types: hook, loop, hinge, spring loaded, special duty, gear-lock. Typical applications, illustrations, dimensions, strike descriptions for all types. *The Bassick Co.*

INSTRUMENTS AND CONTROLS

52—Recorder. G-22 dual channel recorder, described in 4-pager, provides correlation of simultaneous variables. Records any phenomena convertible to voltages. Portable (33 lb.). *Varian Associates.*

53—Optical Comparators. Five fold-out, 6-page brochures give details on basic models of maker's optical comparators and measuring machines. Differentiated by size of screen vs. standard models. *Jones & Lamson Machine Co.*

54—Composition Analysis System. Bulletin CA-860 (12 pages) describes the continuous, non-contacting measurement of fluids in pipes. Radioisotopes are used to detect changes in specific gravity, percent solids, etc. *Industrial Nucleonics.*

55—Temperature controllers. Controls which feature transistor circuits and thermistor-sensing elements are treated in Bulletin MC-190 (8 pages). Four models. Temperatures: −50 to 600 F. *Fenwal Inc.*

56—Transductors. This 38-page manual (T-11) treats in details the characteristics and functions of static transductors. Application section includes description of summation system in a continuous strip plating mill. *Magnetics Inc.*

For more facts Circle 488 on Reader Service Card For more facts Circle 489 on Reader Service Card ➤

Chicago Gear Mfg. Company tames tough steels, cuts costs with STANICUT Oil 208 BCS

Tames tough steels. Gears from one to 300 inches in diameter are machined by Chicago Gear. Steels up to 375 Brinell hardness are worked. STANICUT Oil 208 BCS helps them do it. STANICUT 208 contains maximum amounts of sulfur, chlorine and compounding for handling tough alloy steels. It is viscous enough to stay on tools and work, yet fluid enough for good cooling.

Cuts costs. STANICUT Oil 208 BCS is used at Chicago Gear for all gear hobbing operations and applications requiring a straight cutting fluid. There's no chance of the wrong fluid being used, thus no costly losses. One fluid cuts down inventory, saves time in keeping track of stocks, cuts paper work and ordering.

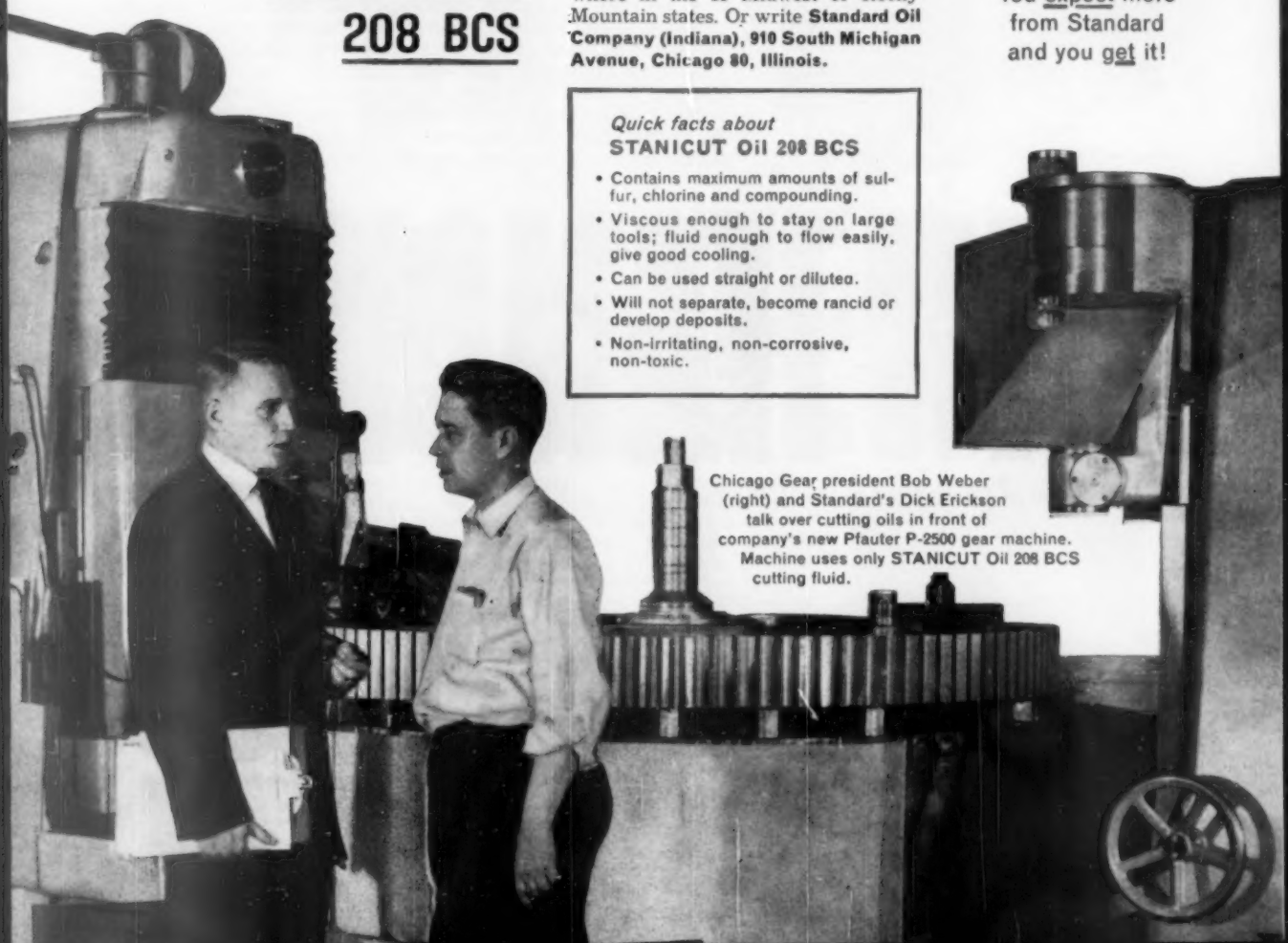
Gets service. Standard Oil's Dick Erickson is assigned to the Chicago Gear account. With a mechanical engineering degree from Purdue, plus several years' lubrication experience, Dick knows how to help a customer, knows how to supply technical help where it counts. Could STANICUT Oil 208 BCS and Standard Oil technical service help you? Ask about them at the Standard Oil office near you anywhere in the 15 Midwest or Rocky Mountain states. Or write **Standard Oil Company (Indiana), 910 South Michigan Avenue, Chicago 80, Illinois.**

STANDARD

You expect more from Standard and you get it!

Quick facts about
STANICUT Oil 208 BCS

- Contains maximum amounts of sulfur, chlorine and compounding.
- Viscous enough to stay on large tools; fluid enough to flow easily, give good cooling.
- Can be used straight or diluted.
- Will not separate, become rancid or develop deposits.
- Non-irritating, non-corrosive, non-toxic.



Chicago Gear president Bob Weber (right) and Standard's Dick Erickson talk over cutting oils in front of company's new Pfauter P-2500 gear machine. Machine uses only STANICUT Oil 208 BCS cutting fluid.

FOR VENTILATION AND DRAFT

COMPLETE AIR CONDITIONING

AIR HANDLING

EFFICIENT AIR CLEANING

"Buffalo"

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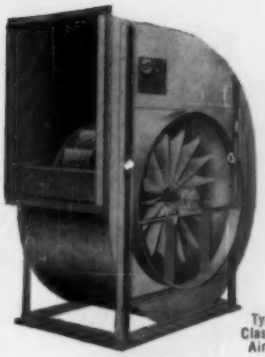
Maximum air moving efficiency with minimum maintenance — for supplying ventilating, air conditioning and air cleaning systems — and other applications. Fully streamlined, from its exclusive 'Buffalo' inlet guide vanes and smoothly curved inlet bell matching the curve of the wheel inlet flange, to its backward curved blades and efficiently shaped housing scroll. Wheels are factory balanced. Non-overloading characteristic provides stable output from free air delivery to shutoff with no danger of motor overload. The entire fan is built up to extra strength at all points of wear and strain, assuring the longest possible life and the minimum of maintenance cost. Write for Bulletin F-104 and check the reliable performance data against your requirements.

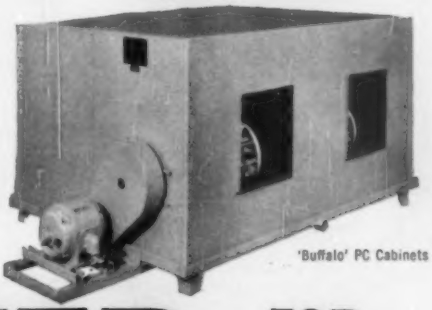


'Buffalo' Type BL Fan Class I and II Air Handling

For your heavy-duty work — high pressure ventilation, air conditioning and air cleaning supply, and many of your toughest mechanical draft applications. The 'Buffalo' BLH has all the streamlining features of the BL, with the addition of the 'Buffalo' divergent outlet, which provides high static conversion and good pressure distribution into the duct. The result is a broad range of static efficiency at 80% and over. As with the BL, it is available with fixed or variable vanes, and delivers stable performance over the entire range. Full engineering data are available in Bulletin F-201. 'Buffalo' also builds complete lines of radial and airfoil wheel fans to meet your most particular requirements. Your 'Buffalo' Engineering Representative will be glad to give you all information and engineering recommendations.

'Buffalo' Type BLH Fan Air Handling Up to Class IV

These are the time-proved units for easy installation and minimum service on the largest or smallest central station air conditioning jobs. Quality 'Buffalo' double-width, double-inlet, non-sparking fans of lightweight aluminum have hollow shafts for vibrationless performance, plus backward curved blades and streamlined housings for completely stable performance. Non-overloading characteristic permits selection of a minimum horsepower motor. Casings are removable heavy-gauge panel, galvanized and factory-primed. All functional elements are supported by a heavy welded steel plate drip pan. Write for Bulletin AC-121 for all details on PC Cabinets. 'Buffalo' builds a complete line of air conditioning cabinets including Zone Control Cabinets with factory-sized damper zones for accuate proportioning of air flow.



'Buffalo' PC Cabinets

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These units are available in a choice of three cleaning stages: (1) wetted impingement-type cells for removal of particulate material that would plug fibers if permitted to pass; (2) wetted fiber cells for absorption of gases; and (3) dry fiber cells for elimination of fine droplet carryover from the unit. Any or all of these cleaning components may be had in the unit designed for your particular nuisance control problem. Other 'Buffalo' units, such as Hydraulic Scrubbing Towers, Air Washers and Hydro Volute Scrubbers are available for the entire range of air cleaning problems — plus 'Buffalo' Engineering know-how, earned over a half-century in this field. Your 'Buffalo' Engineering Representative will gladly study your specific problem and make recommendations.

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FACTORY BOOKS

A massive science reference

It's belaboring the obvious to point out the need for a combined reference on all the sciences. Are there any of us who wouldn't be better informed if only we could go to a convenient source for authoritative answers to our questions on science? Where, for example, are we to start looking when we want to know more about *Van Allen radiation belts* . . . the plans to probe the earth's crust to the *Moho discontinuity* . . . *space biology* . . . *organometallic compounds?* Unquestionably, a science encyclopedia was needed.

The *McGraw-Hill Encyclopedia of Science and Technology* not only fills the need for such a reference, but fills it with admirable authority and completeness. Its 15 volumes contain 9300 pages of science—7200 articles written by 2100 distinguished contributors. Among them are several articles by Nobel Prize winners: Selman A. Waksman on *streptomycin*, Emilio A. Segré on *antiproton*, Glenn T. Seaborg on *transuranium elements*, P. Kusch on *molecular beams*, Percy W. Bridgman on *high-pressure physics*. The work, which has taken five years to complete, contains more than six million words and about ten thousand illustrations. It covers all fields of life science, physical science, earth science, and engineering. In addition, all the major applications of these fields are included. The encyclopedia is written within the comprehension of the college undergraduate and the intelligent layman.

To keep the set up-to-date, there will be a continuous revision program as well as an annual supplement, the first of which will appear early in 1962.

Besides satisfying a widespread thirst for lucid information not generally available, the encyclopedia should prove especially helpful to these people:

The specialist who wants to bridge the gap between his own sphere of knowledge and the unfamiliar areas into which his work leads him.

The alert, progressive businessman who has scant training in the sciences, yet finds his company involved more and more with a pervasive technology. (Reviewed by R. L. Grant)

McGraw-Hill Encyclopedia of Science and Technology. McGraw-Hill Book Co., Inc., 330 West 42nd St., New York 36. 9300 pages. $175.

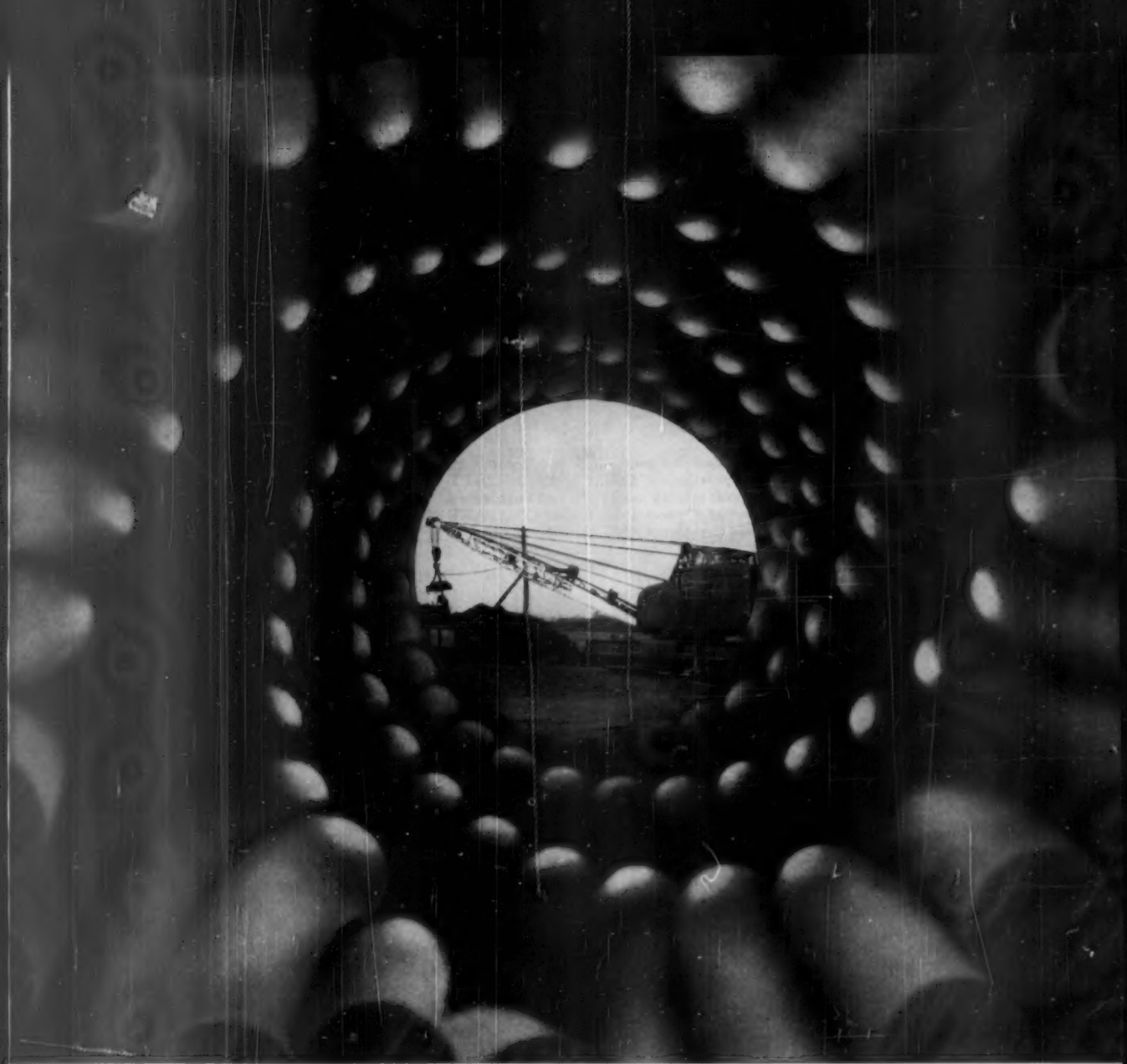
Persuasive Talking

Operating managers—just like you —spend 84.6% of their time talking. At Wolverine Tube Division, Calumet & Hecla, Detroit, this amounts to 114.4 hours a month (FACTORY, December 1958, page 60). In the light of this, *The Art of Persuasive Talking* would be a profitable, as well as enjoyable, investment for any manager.

The book blends the unique talents of two communications experts. Authors Lynn Surles and W. A. Stanbury, combined, are loaded with communications savvy. Surles has a strong background in the art of persuasive talking—he's a consultant to industry, a teacher, a lecturer. His arguments have the ring of experience. Stanbury—a former managing editor for FACTORY—is a persuasive talker in his own right. But more important in this case, he's a gifted writer. He has succeeded in making the book fast, interesting and rewarding to read.

Unlike many books on the subject of successful speaking, this one is as practical as it is inspirational. For example, the authors give this help on starting to talk to a small group:

"Be straightforward. Beware of passing out compliments to your hearers and expressing your pleasure in being asked to talk. No matter how sincere your intentions may be, some people will take this kind of talk as flattery or as boastfulness. Either way, you'll lose your audience fast. The best way to compliment a person or group at the beginning of your remarks is to relate what you



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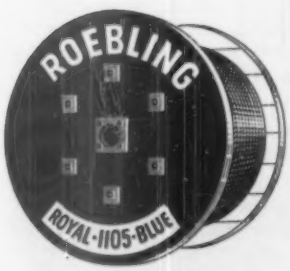

This happens to be the inside view of Roebling Royal Blue — its core has been removed to show the uniformity and symmetry of the rope structure. You see how concerned we are with internal security.

We have to be. To make sure that Royal Blue will live up to the day-to-day demands made upon it. High stresses and unavoidable overloads, abrasion, fatigue, impact, crushing, sheave pressures and abusive drum-winding, to name the major ones.

Royal Blue goes through many inspections and tests—both internal and external —before reporting to work. This way we're sure that the rope we build will do what we sell it to do. These quality-control measures are your assurance that Royal Blue is made to save you money — anyway you look at it.

For details about hard-working Royal Blue, ask your wire rope distributor or write Roebling's Wire Rope Division, Trenton 2, New Jersey.

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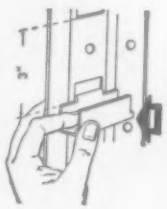
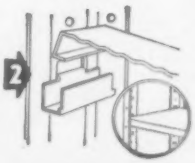


Insert 4 shelf support brackets . . no fumbling with studs, bolts, nuts or lock washers.

Tilt shelf into support brackets . . . and shelf is ready for loading.



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Begins on page 196

have to say to their needs and experience.

"A simple, straightforward opening, for example? Take this one:

"Your chairman was good enough to ask me if I'd talk about arbitration for a while this morning. I'd be glad to share my experiences with you. And I hope that what I have to say may help you handle some of your day-to-day labor problems . . ."

This is not public speaking text, though its advice is applicable to public speaking. It's a helpful guide to the kind of talking—and listening—you do person-to-person or in a small group. It will help you present your thoughts clearly and effectively in your day-to-day work in the plant. (Reviewed by George A. Hoy)

The Art of Persuasive Talking, by Lynn Surles and W. A. Stanbury, Jr. McGraw-Hill Book Co., Inc., 330 W. 42nd St., New York 36. 283 pages. $4.95.

Employee Training

Management of Training Programs is by far the best book yet to be published on the subject of employee training. It is practical, comprehensive, and authoritative. Although written by three college professors, it sacrifices little to clarity.

This book will help anyone responsible for the management of plant operations to understand and apply training principles. Its orientation, as the title implies, is toward management rather than to education as such. The reader will find much about organizing an industrial training program and evaluating its effectiveness. He will find the chapters on instruction techniques, learning principles, and visual aids chockfull of recipes for easy approaches.

While the text covers such areas as supervisory training and management development, it is short on the new trends in group-oriented attitude improvement and "sensitivity" training. But on the whole, it's a very good book in a field that has needed one. (Reviewed by L. B. Bittel)

Management of Training Programs, by F. A. DePhillips, W. M. Berliner, J. J. Cribbin. Richard D. Irwin, Inc., Homewood, Ill. 469 pages. $9.

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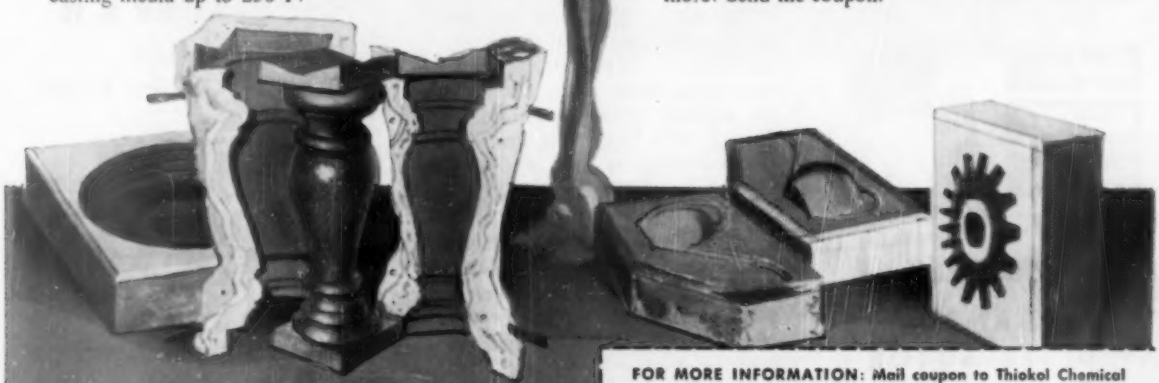

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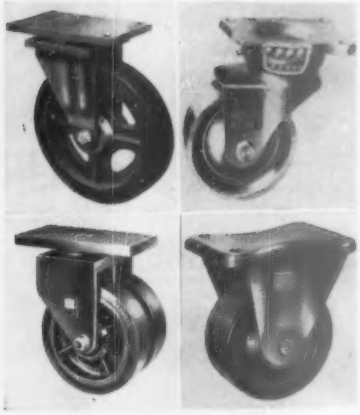

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FACTORY FILMS

Zinc Controls Corrosion shows how modern science applies the "cathodic protection" of zinc to combat damage to metal structures and products by the elements. Reveals, too, the fundamental nature of corrosion—tells how and why rust forms on steel. The film takes you on a trip to a large steel mill to see the production of galvanized steel and the fabrication of various articles. 16mm, sound, color, 38 min. For loan, write to:

Modern Talking Picture Service, 3 East 54th St., New York 22.

Concrete Curtain Walls highlights the use of precast concrete panels for sheathing buildings—from single story to skyscraper. Shows the ever-growing trend toward concrete walls and façades, which have become attractive and practical through the many colors, decorative designs, textures, and panel shapes now available. 16mm, sound, color, 18 min. Write to:

Portland Cement Assn., 33 West Grand Ave., Chicago 10.

How to Locate Flaws with Dye Penetrants demonstrates aspects of dye penetrant inspections—from laboratory theory to production-line techniques. Shots, taken on location during mass production dye-penetrant inspections, show checking of truck wheels, valves, etc. They also show what takes place when flaws are located. 16mm, sound, color, 23 min. For loan, write to:

Turco Products, Inc., 24600 South Main St., Wilmington, Calif.

Air Pollution—Everyone's Problem explains the causes and effects of air pollution (smog) and illustrates how a large plant solved the problem. 16mm, sound, color, 20 min. For loan, write to:

Kaiser Steel Corp., Public Relations Dept., 300 Lakeside Drive, Oakland 12, Calif.

Educational Film Guide (1960) and revised 1954-1958 Cumulative List contain over 7000 16mm films—listed by titles, subjects, and sources. Write to:

H. W. Wilson Co., 950 University Ave., New York 52.

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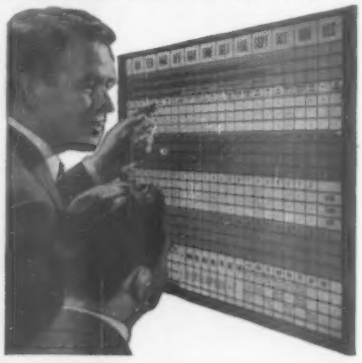

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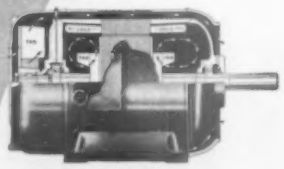

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See why Pittsburgh Corning Products make the things you build look better, last longer, cost less

example: NEW FOAMGLAS-BOARD Roof Insulation

The acknowledged quality of FOAMGLAS is now available in a new, reduced thickness in a large unit size which reduces the number of roof insulation joints and promotes fast, economical handling and installation. FOAMGLAS-BOARD is composed of multiple blocks of FOAMGLAS, 1½" thick, faced on each side with a special asphalt-laminated paper.

FOAMGLAS-BOARD has been approved by the Associated Factory Mutual Fire Insurance Companies for Class I insulated steel roof deck construction when applied with hot asphalt.

A new brochure contains complete information. For a copy, simply mail the coupon on the third page of this advertisement.

PITTSBURGH **CORNING**

For more facts Circle 498 on Reader Service Card

example: PC Glass Block Panels bring four important benefits to Electric Boat

Even density lighting, good atmospheric control, attractive appearance and minimum maintenance. These benefits have proved the soundness of the decision by Electric Boat Company, Division of General Dynamics, to use PC Glass Blocks for new panels and sash replacement at their Groton, Conn., plant. Attractive on the outside, the Glass Block panels have virtually eliminated morning glare and afternoon shadow in laboratories and working areas.

The excellent insulating value of the blocks makes it far easier to insure accurate, pressurized atmospheric control within the building. Maintenance has been negligible . . . with nothing to rust, rot or need painting . . . and not a single instance of breakage or structural failure in the glass block panels.

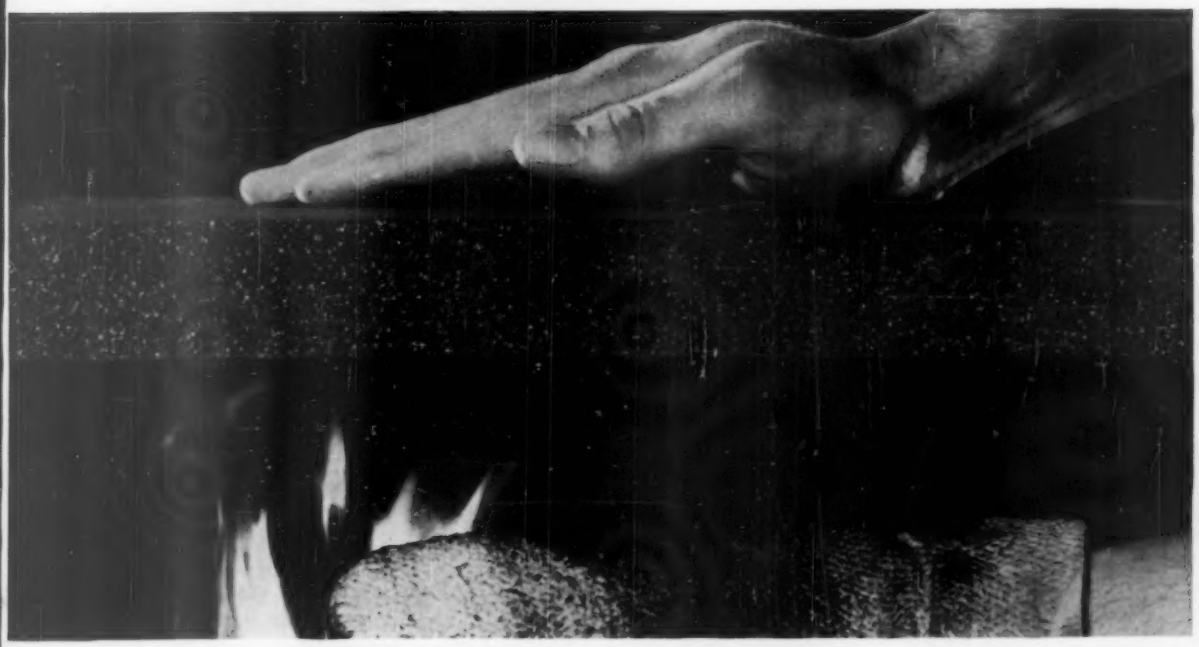
This kind of experience makes PC Glass Block panels the odds-on favorite to eliminate window problems in virtually any type of industrial plant or commercial building.

Take advantage of the coupon on the next page of this advertisement.

For more facts Circle 499 on Reader Service Card

PITTSBURGH

example: FOAMGLAS® insulation to keep heat in its place



Most roof insulations do an adequate—or better—job of controlling heat flow when they're first installed. But not many maintain their initial level of performance beyond a period of surprisingly few months. FOAMGLAS is one of that select few. The reason is simple. FOAMGLAS is the only thermal insulation composed entirely of sealed glass cells. Result: moisture can never penetrate FOAMGLAS to condense and form a heat leak as it does in other materials. Insulating performance never varies. Here you see one of the many excellent reasons for a FOAMGLAS specification on a roof . . . as well as walls or piping —wherever heat flow must be controlled.

PITTSBURGH CORNING CORPORATION
Dept. FF-120, One Gateway Center, Pittsburgh 22, Pa.

Please send me descriptive literature on the products checked below.

- ☐ FOAMGLAS-BOARD ™
- ☐ FOAMGLAS Roof Insulation
- ☐ FOAMGLAS Low Temperature Insulation
- ☐ FOAMGLAS Insulation for Industrial Piping
- ☐ FOAMGLAS Stay-Dry Pipe Insulation for Building Service Lines
- ☐ FOAMGLAS Insulation for Curtain Wall Panels
- ☐ PC GLASS BLOCKS
- ☐ The PC 4 x 12 Block
- ☐ PC Color Glass Blocks
- ☐ FOAMSIL,® the Acid-proof Insulating Refractory
- ☐ PC Sculptured Glass Modules
- ☐ GEOCOUSTIC ™

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CORNING

For more facts Circle 500 on Reader Service Card

Ceramic-metal combine stands brutal treatment

Ceramic-metal composites, called Nucerite, have been undergoing laboratory tests that reveal some remarkable chemical and physical properties:

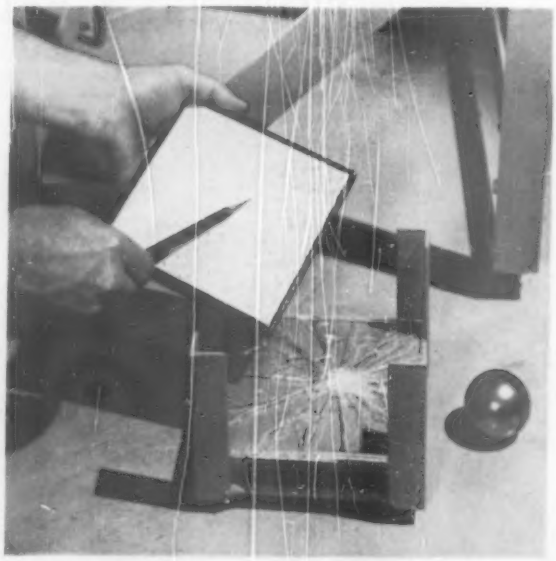
1. Not appreciably affected by hydrogen chloride at 1200 F. flowing through a Nucerite pipe for 15 hours.

2. Ceramic component withstood 18 times the point impact force needed to shatter ⅜-in. safety glass.

3. Takes a 1200 F. thermal shock, a 300% to 400% increase over existing glassed metals.

The new ceramic is chemically bonded to steel and to heat-resistant metals such as Inconel and Hastelloy. It's probable that certain reactive metals, such as tantalum, columbium, and molybdenum (which maintain strength at elevated temperatures) will also serve as base metals.

According to the company, agents act as centers of nucleation during a heat-treating cycle that follows application of the ceramic to the base metal. Result is a ceramic structure with a large number of very small crystals. It is this structure that imparts unique physical and chemical properties to the material. *The Pfaudler Co.* (Circle 195).



Nylon plate in 2-ft. widths, 4-ft. lengths, thicknesses of ½- through 4-in., is expected to expand applications for nylon in such uses as wear plates, bumper pads, tooling and fixtures, other wear parts. On special order, the plates can be supplied in thicknesses to 6 in., sections to 4x10 ft. Tubular bar and rod up to 17-in. OD are also available. Prices average 15% below regular line. *The Polymer Corp.* (Circle 199).

196—Insulating Curtain-Wall Panel is translucent, consists of glass fiber reinforced skins with an air insulating core. Condo-lux panels come in 2-, 3-, 4-in. thicknesses, standard width of 32 in., 4- to 12-ft. long. They're shatterproof, come in colors. *Dresser-Ideco Co.*

197—Steel-Armored Porcelain Pipe and fittings are for process service at high temperatures and pressures (up to 150 psi. and 400 F.). Steelclad pipe comes in diameters from ½ to 8 in., can be ordered with necessary fittings to handle severe corrosives. *Lapp Insulator Co.*

198—Shrink-Proof Mounting Cement is for anchoring machinery, including heavy-duty vibrating equipment. It's applied cold by adding water, has a guaranteed strength of 5000 psi. within one hour of application; increases to 12,000 psi. full strength. *Garon Products Inc.*

Rustproof packaging

This heat-sealable Mylar packaging material treated with a volatile corrosion inhibitor protects ferrous metal parts and components with an invisible vapor that fills the package. Called Nox-Rust Clear-Pak, it allows ready identification of the packaged item. Can be printed by users on automatic printing machinery; comes in several sizes. *Daubert Chemical Co.* (Circle 200).

Turn the page

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Detrex Engineers Have Been Coming Up With "Cost Saving" Answers for 30 Years

Every metal cleaning operation has its own particular problems—but they're seldom new to the Detrex engineer. With 30 years of experience, he can produce the right formula to insure maximum productivity and economy in your operation.

He will analyze your product, the type of soil to be removed, the proper equipment and cleaning agent needed, the space and manpower required—every factor that bears on the problem.

When he gives you his recommendation, you can depend upon it to make sense—and save dollars. And when you put his recommendation into practice, you can depend upon Detrex to follow through with the finest service in the business.

Depend on DETREX for Every Metal Cleaning and Processing Need

- PERM-A-CLOR NA (Trichlorethylene)
- Solvent Degreasers
- Ultrasonic Equipment
- Industrial Washer
- Phosphate Coating Compounds
- PAINTBOND Compounds
- Aluminum Treating Compounds
- Alkali and Emulsion Cleaners
- Rustproofing Materials
- Extrusion and Drawing Compounds
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Write for your free copy of Dr. C. E. Kircher's informative paper: "Solvent Degreasing—What Every User Should Know."

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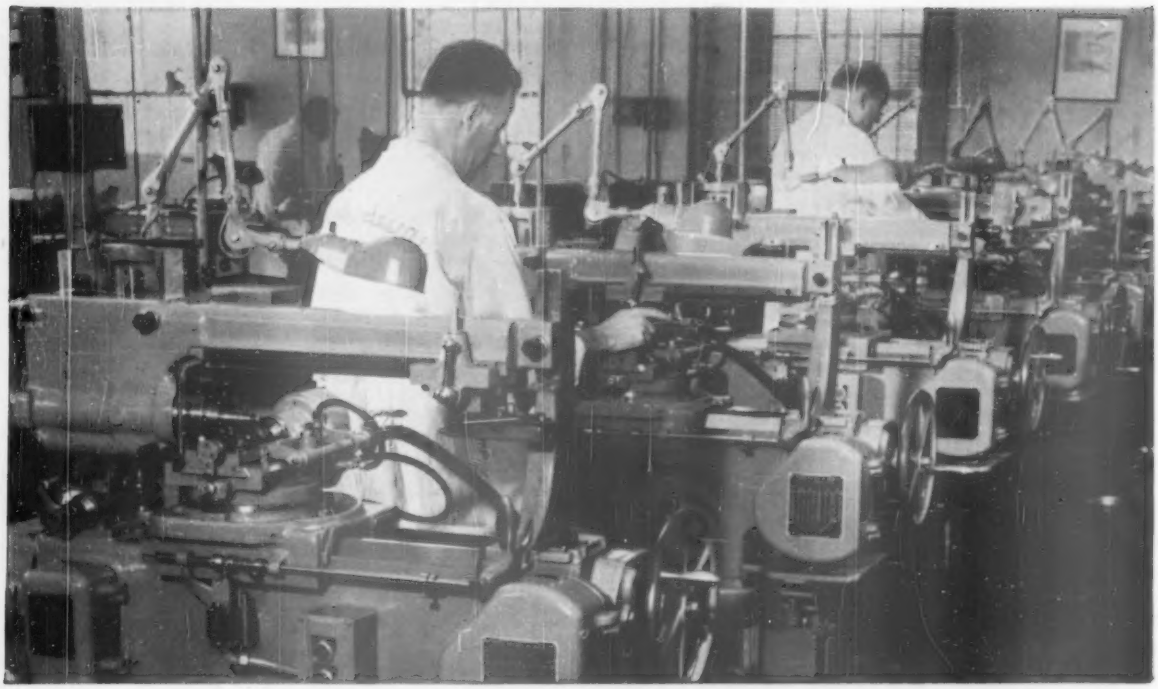
World's Largest Exclusive Producer of Cleaning Chemicals and Equipment

Better products, *faster*, from your National Seal distributor:



Don't take bearing protection for granted... install new National Oil Seals regularly!

Scheduled replacements with these low-cost seals can pay big dividends in low maintenance costs

Most shops have discovered the money-saving advantages in replacing old oil seals with new National Seals at regularly scheduled intervals to protect precision machines. National Seals hold in lubrication. They seal out abrasive grit and corrosive elements which damage bearings. *Micro-Torc*® leather and *Syntech* synthetic, National exclusives, offer unlimited protection for all applications.

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DIVISION OF FEDERAL-MOGUL-BOWER BEARINGS, INC. • DETROIT 13, MICHIGAN

For more facts Circle 502 on Reader Service Card

FACTORY/MATERIALS NEWS

Begins on page 204

For more about these items, circle item numbers on Reader Service Card next to back cover.

201—Aluminum Electrode with extruded flux coating is for use in DC reverse polarity welding of aluminum sheet, plate, and castings. Slag removal and deposition control are said to be superior to standard dip-coated electrodes. *All-State Welding Alloys Co., Inc.*

202—Asbestos-Cement Roof Decking, which resists rotting and fire, provides a structural deck for built-up roofing and a finished, non-flaking ceiling that needs no painting. Comes in 8- and 10-ft. spans, ⅜-in. thick. Assembles dry without bedding. *Keasbey & Mattison Co.*

203—Insulation Sealer, called Insulcap, protects against condensation on insulation equipment, such as steam pipes, furnaces, converters, digesters. Dries to touch in 20 minutes, is odorless, can be color-tinted. Comes in 1-, 5-, and 55-gal. containers. *The Glidden Co.*

204—Rigid Urethane Closed Cell Foam is self-extinguishing, offers low temperature insulation at low cost. Comes in half-round sections 36-in. long and 12x36-in. blocks up to 5-in. thick. Temperature limits are from −300 F. to 220 F. *Union Asbestos and Rubber Co.*

205—Flexible Vinyl Tape has finely divided magnetized particles that provide strong magnetic attraction over one surface; other side is practically non-magnetic. Can be molded, printed, extruded. Widths are 3/16 to 2 in.; thicknesses 1/16 to ¼ in. *Applied Magnetics Corp.*

Turn the page

ADAMS

. . . Superior Performance at Lower Prices

Adams Aftercoolers provide superior condensation of pipeline oil and water vapor by reducing gas or air temperature to within 10° of cooling water. This performance, unique in the industry, is made possible by Adams' specialization in these units for over 25 years. During this time, mass-production techniques have developed these superior design features at a lower purchase cost:

12-PASS WATER CIRCULATION — provides maximum heat exchange from tube bundle — cooler discharge air.

FREEDOM FROM OPERATING TROUBLES — full floating rear tube sheet compensates for expansion. Floating tube sheet is machined parallel after rolling to assure long life to packing seal. Packing gland is locked rigidly in place on adjustable studs to isolate pipe line expansion strain, thereby protecting the packing.

ADAMS CYCLONE SEPARATORS have an exclusive cyclone design for maximum extraction of oil laden condensate; their separation efficiency is constant over a wide range of loads — features not found in other separator designs.

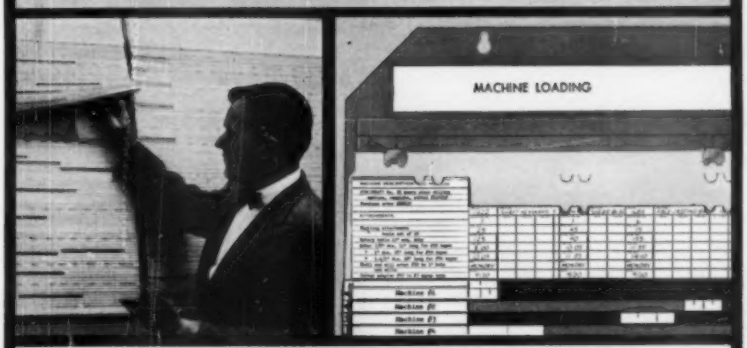
WRITE TODAY for Bulletin 714 for the engineering details that make Adams your best value for clean, dry, cool compressed air or gas.

R. P. ADAMS CO., INC. • 215 East Park Drive, Buffalo 17, N. Y.

AFTERCOOLERS

For more facts Circle 503 on Reader Service Card

NEW LOW-COST WAY TO RAISE OUTPUT



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Timing is the essence of high production at low cost. And Acme Visible Panels make it easy for you graphically to plan, schedule and follow through every job. Machine loading. Personnel assignment. Shipping. Data cards in pockets keep essential facts at your fingertips. Visible margins portray your scheduling and work progress at a glance. Send for full facts.

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For more about these items, circle item numbers on Reader Service Card next to back cover.

206—Resin Cleaner to prolong the useful life of cation exchange-type water softeners costs as little as 3% of bed replacement price. Dissolves in cold water, has high stability in powder form; may be stored without special precautions for humidity. *Ionac Chemical Co.*

207—Permanent Air Filter Units for use in forced air systems have aluminum mounting frames with a permanent, washable, stainless-steel mesh filter element. No standard sizes; units are made to user specifications. Samples for testing. *Transdyne Ultrasonics Corp.*

208—Metal Stripper for nickel, brass, copper, other metals dissolves in water at room temperature to make solution that will strip any of these metals from steel. Concentration is 20 oz. per gal. Won't attack base metal. Steel tanks may be used for stripping. *Enthone, Inc.*

209—Soft Seam Adhesive is for bonding closed-cell vinyl foam to itself, to fabric, and to most other rigid and flexible materials. May be brushed, roll-coated, or sprayed with conventional equipment. Achieves foam-tearing strength upon contact. *Rubber & Asbestos Corp.*

210—Surface-Treating Process color-coats all types of metals in a single treatment. Low-viscosity solution comes in seven colors, drips free quickly with little carry over. Curing time can be as short as a few seconds, depending on heat source. *Pennsalt Chemicals Corp.*

Turn the page

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hoover quality BEARINGS AT THEIR BEST

Hoover bearings achieve highest quality standards through the use of exclusive *Micro-Velvet* balls, accurate within millionths of an inch, and *Hoover-Honed* raceways that are super smooth, superbly finished.

To preserve this superior quality throughout extended life, Hoover bearings can be protected with shields and seals to lock out dirt, grime and other harmful contaminants. As shown above, shields, seals in Teflon and felt, and a combination of shields and seals meet a wide range of requirements. To assure highest quality . . . best protection . . . specify Hoover sealed or shielded ball bearings. Get complete information from your local Hoover bearing distributor listed in the Yellow Page Directory, or write us direct.

Micro-Velvet and *Hoover-Honed* are Hoover Trademarks. Teflon is a DuPont trademark for its fluorocarbon resins.

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Badger's 2" stainless steel meter with magnetic drive...

high accuracy on chemical and fertilizer applications

- Ruggedly constructed of Type 316 stainless steel for measuring liquid fertilizer and corrosive chemical solutions.
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- Order with low-cost standard totalizer, combined gallon totalizer and reset totalizer or electric batch. Can be equipped with remote reading Read-o-Matic register as accessory.
- *Typical uses:* measuring, blending, batching of liquid corrosive chemicals and fertilizers in manufacturing and bulk plant operations.

Badger Meter Mfg. Co.

Industrial Products Division
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Write for descriptive literature

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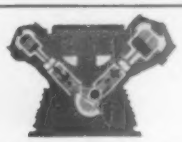

ANSWER

to Worthington Hidden Value Puzzle

The fictitious "hidden value" on the back cover is, of course, the "Articulated Connecting Rod." This design is found only on light duty compressors with single acting cylinders.

The true Worthington connecting rod construction is shown above. Each rod is directly mounted on the main crankshaft, giving greatest bearing area and stronger linkage. There are fewer parts in all, maintenance is simpler and lubrication is less complex. Worthington Corporation.

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FACTORY
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FACTORY / MATERIALS NEWS

Begins on page 204

For more about these items, circle item numbers on Reader Service Card next to back cover.

MATERIALS LITERATURE

211—Iron-Nickel-Cobalt Alloy specially designed for ceramic-to-metal sealing is discussed in 6-page folder. Includes curves of thermal characteristics, table of physical properties, and data on fabricating processes. *Wilbur B. Driver Co.*

212—Ductile Iron Castings, their production and uses, are covered in a 20-pager, No. 131-B. Charts and extensive photos show material properties, and company's facilities. Discusses metallurgy of ductile iron. *Brillion Iron Works, Inc.*

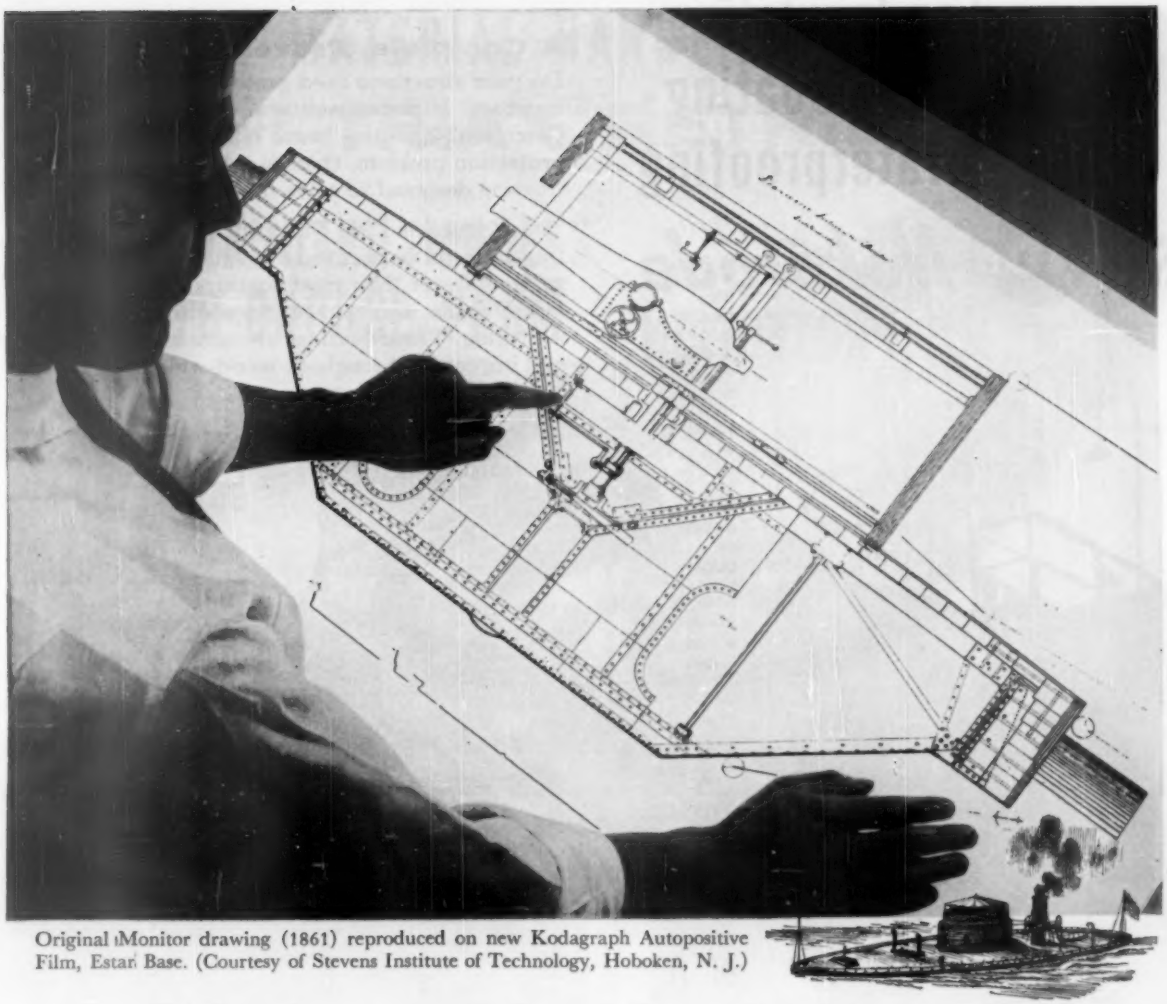
213—Weatherproof Coating for concrete and masonry is described in 4-pager. Contains illustrations of buildings waterproofed with Flexible Resisto-Crete, plus detailed information on its properties. *Western Waterproofing Co., Inc.*

214—Magnetic Alloy for the electronic industries is covered in a 16-page booklet that has information on testing, hysteresis loops, heat treating, magnetization curves, core loss, and mechanical properties. *Allegheny Ludlum Steel Corp.*

215—Polysulfide Rubber cold-setting flexible mold compounds are detailed in 4-page booklet that gives practical information on uses and properties. Has step-by-step photos. *Smooth-On Mfg. Co.*

216—Epoxy Compounds of this company cover a wide range: bonding, patching, joint and crack sealants, surface coating for concrete, floor resurfacing. The 6-page technical bulletin discusses use, toxicity, etc. *Sitka Chemical Corp.*

217—Sound Control Products such as tile, insulating doors, barriers, and ducting silencers get detailed technical treatment in a 20-page booklet. Product photos, installation diagrams, noise reduction factors. *Elof Hansson, Inc.*



Original Monitor drawing (1861) reproduced on new Kodagraph Autopositive Film, Estar Base. (Courtesy of Stevens Institute of Technology, Hoboken, N. J.)

Made to take the bruises!

New Kodagraph Autopositive Film, Estar Base, gives you intermediates that are as tough as they come and have exceptionally sharp detail.

Here's the ideal choice for general reproduction work and drafting-room use. Same-size, positive intermediates are produced directly without a negative step. And there's the added convenience of being able to expose and process under room light. Excellent results are obtained with either "print-through" or reflex printing, even when reflexing from metal templates.

See this versatile new Kodagraph Film—and the others in the new *Estar Base line:* Kodagraph Contact Film; Kodagraph Projection Film.

All combine reliable Kodak emulsions on the new Estar Base—highly translucent, durable, and dimensionally stable, with excellent matte surface on both sides for easy drafting. Available in standard drawing sheet sizes and in rolls up to 52 inches wide. Call your local Kodagraph Dealer, or write Eastman Kodak Company, Graphic Reproduction Division, Rochester 4, N. Y.

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For Insulating · Sealing · Coating · Waterproofing

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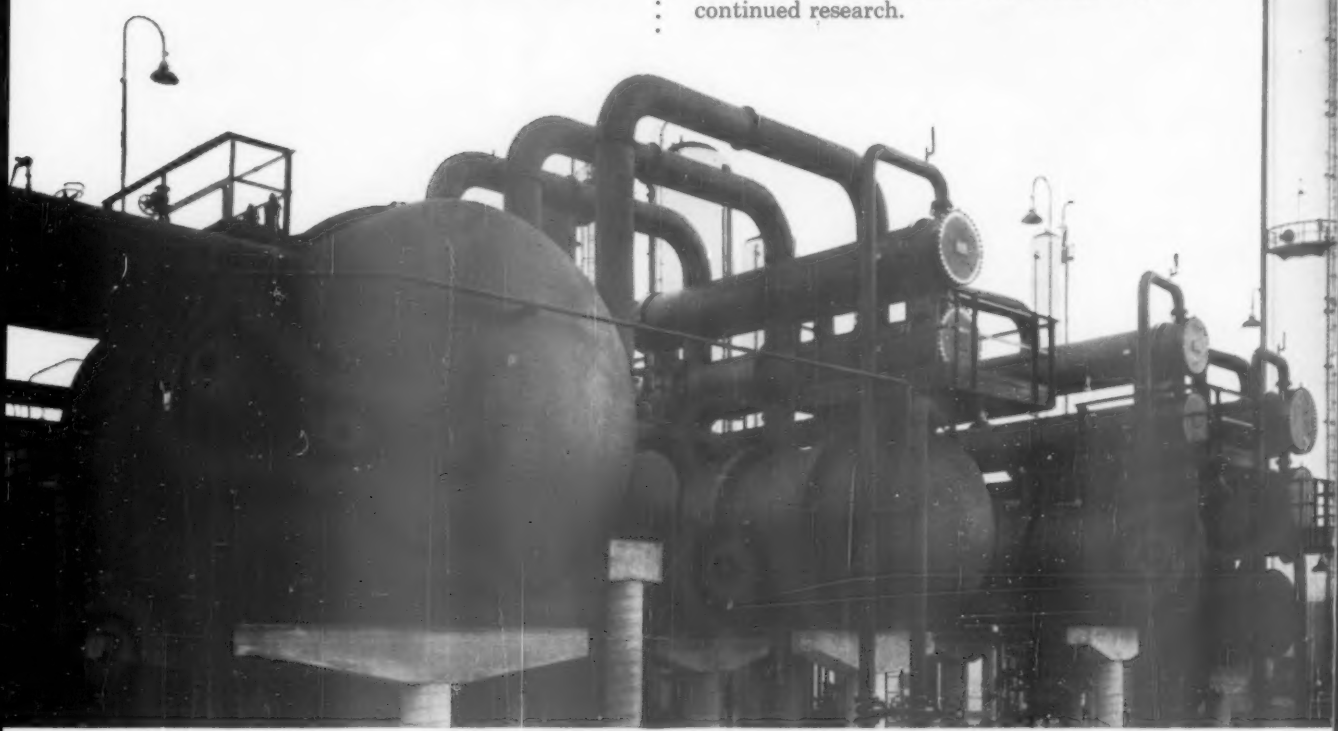
A Complete, Proven Line

Do your structures need protection from moisture? High temperature? Low temperature? Corrosion? Escaping heat? Whatever your protection problem, there is a Lion Nokorode Coating designed to solve it.

Tough, durable Lion Nokorode Protective Coatings can be sprayed on regular or irregular surfaces faster than most coatings. They adhere at any angle, and change shape without rupturing. These coatings are constantly proved and improved throughout world-wide use and continued research.



Lion Nokorode Seal Kote protects vessels and pipes from corrosion in a modern chemical plant.

The Best Technical Information

While developing the complete line of Nokorode Coatings, Lion Oil and its parent company, Monsanto Chemical Company, also have developed the most complete file of technical information in the industry. Tell us your problem. We will send you the technical literature which applies. Just mail the coupon.

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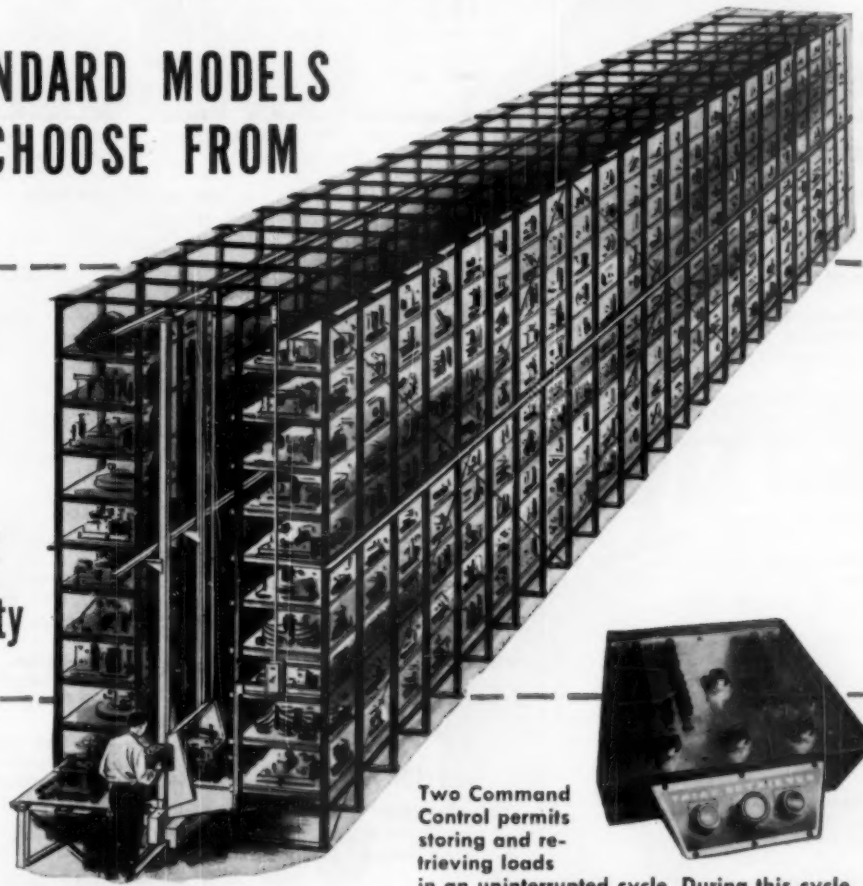
19 STANDARD MODELS TO CHOOSE FROM

Pre-engineered Modules... from 12'–24' height 1000 lb. capacity



Two Command Control permits storing and retrieving loads in an uninterrupted cycle. During this cycle, the operator is free to perform other duties.

LOAD DIMENSION PARALLEL TO AISLE		18″	24″	30″	36″	42″
PERPENDICULAR DIMENSIONS	24″	R34	R44			
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	42″	R37	R47	R57	R67	R77
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Other units are available up to 2500 lb. capacity. For further information write or call . . .

RANDOM STORAGE . . . PINPOINT LOCATION

Floor-to-ceiling storage with a Triax Retriever can save up to 70% plant area or labor . . . and offers immediate access to parts, tools, dies or inventory in storage.

The R-46 illustrated contains 460 openings with a total of 2760 square feet of storage space. It occupies only 550 square feet of floor space. Load height is 13″ including a 1″ slab pallet, but can be varied to meet your needs.

Triax now offers a wide range of R-Series Retrievers to fit your individual requirements.

THE TRIAX COMPANY

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ADVERTISERS' LITERATURE

Offered in ads received up to 5th of last month. To get items you want, circle numbers on Reader Service Card next to back cover.

MECHANICAL

275— Chains/Sprockets. Bulletin gives data on full line of chain and taper-lock sprockets. Dodge Mfg. Corp.

276—Drives, Couplings, Bearings. You'll want bulletins on fluid drives, chain couplings, bearings. Dodge Mfg. Corp.

277—Speed Reducers. Book 2719 covers single, double, triple reduction parallel shaftspeed reducers. Link-Belt Co.

278—Chains/Sprockets. Catalog 1050 and LXS Book 2454 give details on design, mechanical features. Link-Belt Co.

279—V-Belt Drives. These drives for more power are covered in Booklet M141. Raybestos-Manhattan, Inc.

PRODUCTION

280—Steel Strapping Machine. Write for Idea No. S4-12 and examples of uses in specific fields. Acme Steel Co.

281—Industrial Diamonds. Booklet on functions and findings of research laboratory. Diamond Research Laboratory.

282—Air Control Devices. Catalog lists various sizes and types air circuitry products. A. Schrader's Son.

283—Immersion Heaters. Bulletin PD105 contains specifications, prices of several models. Edwin L. Wiegand Co.

284—Air Tools. Bulletin 53-C lists line of portable tools for production applications. The Rotor Tool Co.

285—Metal Cleaning. "Solvent Degreasing—What Every User Should Know" is free. Detrex Chemical Industries.

286—Strapping Machine. Send for "M20 Series Standard Power Strapping Machines." Signode Steel Strapping Co.

287—Visible Records. Here's data on production planning and control panel systems. Acme Visible Records, Inc.

288—Product Finishing. Brochure lists automatic painting machines, components. Conforming Matrix Corp.

289—Electric Counters. Full information on line of electro-magnetic flexible counters. Veeder-Root, Inc.

290—Plier-Type Tools. Hand Tool Manual contains money-saving application data, case histories. Sargent & Co.

291—Air Cylinders. Bulletin 91017, "Airmatic Cylinders for Automation," lists miniature line. Airmatic Valve Inc.

292—Polysulfide Polymer. Here's data on compounds based on liquid polymers as raw materials. Thiokol Chemical Corp.

293—Temperature Controllers. Catalog lists complete line "500" series temperature controllers. Fenwal, Inc.

294—Industrial TV. Write for copy of closed-circuit TV system-planning guide; many applications. Philco Corp.

PLANT SITES

295—Upstate, N. Y. Complete information on services available to help in selection. Niagara Mohawk Power Co.

296—Pennsylvania. "Plant Location Services" pamphlet; data on financing. Pennsylvania Dept of Commerce.

297—Louisiana. Booklet "Louisiana Invests in Industry," plus other facts. Louisiana Dept. of Commerce.

298—Colorado. Executive portfolio "Industrial Colorado" has up-to-the-minute data. Colorado Dept. of Development.

299—Northern Plains. Details on plant production capacities in this five-state area. Northern Natural Gas Co.

BUILDING

300—Floorplate. Bulletin SD-S10 gives fabrication and application data on steel floorplate. Alan Wood Steel Co.

301—Acoustical Panels. Here's a folder that tells how you can solve sound control problems fast. The Eckel Corp.

302—Floorplate. Booklet describes wide applications of versatile 4-way safety floorplate. Inland Steel Co.

MAINTENANCE

303—Paint. Booklet, "Color Dynamics," tells what it is and how to use it. Paint Div., Pittsburgh Plate Glass Co.

304—Lubricants. Lubriplate Data Book is a helpful treatise on lubrication. It's free. Fiske Bros. Refining Co.

305—Protective Coatings. Here's information on specifications, and application techniques. Lion Oil Co.

306—Asbestos Packings. Bulletin SLP-659 gives service conditions, applications, prices. Greene, Tweed & Co.

307—Paint. "How to Put Color to Work" is a 28-pager on painting program. E. I. du Pont de Nemours & Co.

308—Masonry Adhesives. Bulletins describe adhesive coatings for new or old masonry surfaces. Swift & Co.

309—Battery-Powered Scrubber-Vac. Literature covers labor-saving features, other benefits. Finnell System, Inc.

310—Paint. Write for "Quick Reference Guide" and "How to Reduce Painting Costs." Barreled Sunlight Paint Co.

311—Machine Mounts. Book on all types of mounts from laboratory equipment to giant presses. Unisorb Div., Felters Co.

PLANT SERVICES

312—Compressors. Bulletin LA-1 on new heavy-duty models—50 to 240 cfm. piston displacement. Gardner-Denver Co.

313—Fans. Catalog 517 (36 pages) includes selector charts, capacity tables, dimensions, other data. Clarage Fan Co.

314—Shop Furniture. Here's a 92-pager (No. 100) that describes line of steel equipment. Lyon Metal Products, Inc.

315—Pumps. This booklet, "How to Solve Pumping Problems with Series 3600 Pumps," is free. Roper Hydraulics.

316—Fire Alarms. Technical planning guide explains operation of fire protection system. The Gamewell Co.

317—Dust Collectors. Illustrated brochure will help you select job-tailored units. Aget Mfg. Co.

318—Fans. Bulletin F-104 has performance data on type BL fan. Class I and II air handling. Buffalo Forge Co.

319—Fans. Bulletin F-201 gives details of type BLH fan, air handling up to Class IV. Buffalo Forge Co.

320—PC Cabinets. Bulletin AC-121 gives characteristics of these PC air conditioning units. Buffalo Forge Co.

321—Work Benches. This 16-pager (No. 204) gives shapes and sizes of 264 models. Equipto Div., Aurora Equipment Co.

322—Duct Furnaces. Catalog SA-5900 gives installation and maintenance costs of direct-fired heaters. Reznor Mfg. Co.

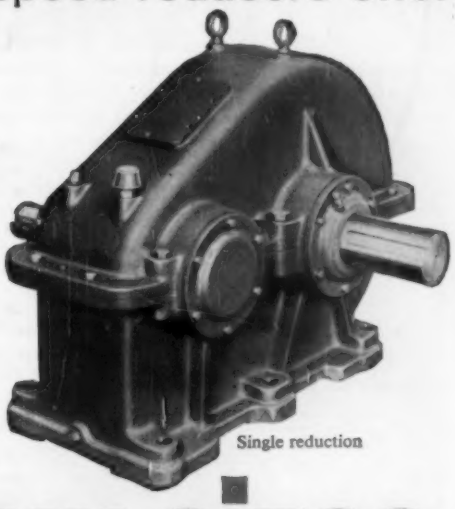
323—Compressors. Need small or large compressor? Facts and photos are given in this free booklet. Atlas Copco.

324—Air Conditioning. Want this booklet, "Will factory air conditioning pay off for me?" Carrier Air Conditioning Co.

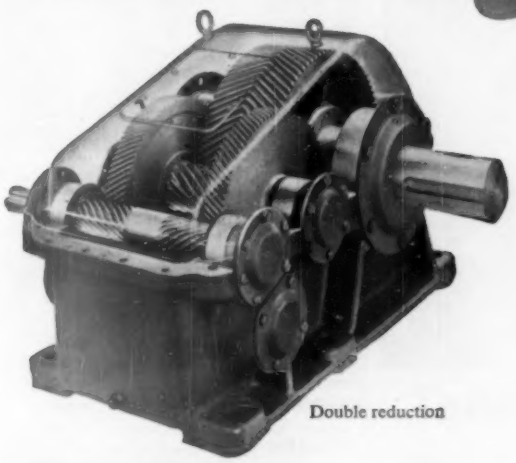
Turn the page

NOW Link-Belt parallel shaft speed reducers offer

new design



Single reduction



Double reduction

new sizes

new ruggedness

Triple reduction

reduce drive costs by matching drive size to horsepower requirements with 35% more sizes

New design—Herringbone or double helical gears arranged in new "balanced" design permit high horsepower, high ratio reduction in a sturdy, compact housing.

New sizes—Now 18 sizes each of double and triple reduction units; 17 single. Drive selections closely match hp requirements, with a corresponding reduction in drive costs. Available to 2800 hp, ratios to 292:1.

New ruggedness—Rigid, ribbed housing keeps parts accurately and permanently aligned even under grueling operating conditions involving heavy shock loads, and temporary overloads.

For complete information call your nearby Link-Belt district sales office or authorized stock-carrying distributor. Ask for Book 2719.

OUTSTANDING FEATURES

- Grease-lubricated seals.
- Positive splash lubrication supplies ample flow of oil to all moving parts.
- High-capacity spherical roller bearings for maximum loading.
- Gears of hardened, precision alloy steel. Double helical or herringbone design.
- New, built-in backstop.
- Exceptional wearing qualities in accurately machined low-speed shafts of heat-treated carbon steel; intermediate shafts of chrome-molybdenum steel.
- Cast iron housing maintains permanent, accurate alignment of all parts.

LINK-BELT

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LINK-BELT COMPANY: Executive Offices, Prudential Plaza, Chicago 1. To Serve Industry There Are Link-Belt Plants, Warehouses, District Sales Offices and Stock Carrying Distributors in All Principal Cities. Export Office, New York 7; Australia, Marrickville (Sydney); Brazil, Sao Paulo; Canada, Scarboro (Toronto 13); South Africa, Springs. Representatives Throughout the World. 15,364

Professor Lucius von Hausen, of aeronautics fame, reads in a balloon.

"Sort of keeps me on top of things," he says. Fair enough . . . but other engineers and executives prefer to read with their feet on the ground, especially when they're reading about business. Remember, a good place to read is a good place to think . . . and if you pay engineers and managers to think, encourage them to do more reading. Like so many successful men who read their "most useful" McGraw-Hill publications, they'll find the best place . . . home or plant, office or hammock. But wherever they read, remember, you share in the rewards.*

**Yes, when they read, you profit, too. Write on your business letterhead for a personal copy of booklet, "The McGraw-Hill Engineered Reading Program."*

ADVERTISERS' LITERATURE

Begins on page 214

Offered in ads received up to 5th of last month. To get items you want, circle numbers on Reader Service Card next to back cover.

325—Valves. Here's literature that illustrates bronze swing, globe, gate, other valves. The Wm. Powell Co.

326—Fluid Meters. Write for literature on measuring, blending, batching applications. Badger Meter Mfg. Co.

327—After Coolers/Separators. Bulletin 714 has engineering details on air-actuated equipment. R. P. Adams Co., Inc.

328—Storage Racks. Catalog presents facts on slide-and-lock adjustable storage racks. American Metal Products Co.

329—Waste Receptacles. Brochure lists full line, including Sani-Can step-on receivers. Bennett Mfg. Co., Inc.

330—Steel Shelving. Here's a booklet that illustrates simple, adjustable, rapidly assembled line. Borroughs Mfg. Co.

331—After Cooler. Bulletin 130 tells how to get drier or cooler air or gases at low cost. Niagara Blower Co.

332—Compressors. Literature describes 2-stage rotary compressors. Lists sizes, capacities. Allis-Chalmers Mfg. Co.

333—Valves, Regulators. Write for information on valving gases, liquids, and slurries. Rockwell Mfg. Co.

334—Meters. Literature tells about meters for measuring liquids and gases at low cost. Rockwell Mfg. Co.

335—Hose. Bulletins M620 and M694 cover non-kinking types for air, water, other fluids. Raybestos-Manhattan, Inc.

MATERIAL HANDLING

336—Lift Trucks. Booklet shows you the one best way to finance your material handling trucks. Hyster Co.

337—Slings. This new handbook tells all about slings—types, dimensions, rated loads, etc. Union Wire Rope Corp.

338—Tramrail Cranes. Engineering and Application Booklet No. 2008 is packed with data. Cleveland Tramrail Division.

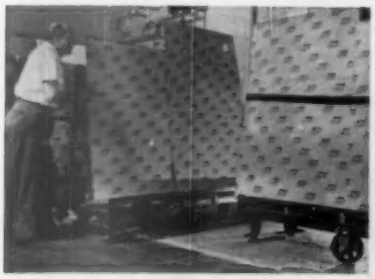
339—Tractor-Shovels. Booklet "Industrial Material Handling from A to Z" is free. The Frank G. Hough Co.

340—Screw Conveyors. Book 2989 gives full details on complete line, components and applications. Link-Belt Co.

Turn the page

MATERIALS-HANDLING NEWS

NEW AND UNUSUAL APPLICATIONS OF BASSICK CASTERS THAT MIGHT BE ADAPTED TO YOUR HANDLING PROBLEMS



"Easy to Maneuver"

...is the way to describe the specially designed carts used in this plant to handle large, heavy sheets of plastic. Two heavy-duty Bassick series "78" casters at the center of each cart take the main part of the load. Two smaller Bassick series "77" casters at each end prevent tipping. The large size and roller-bearing construction of these casters makes rolling easy despite floor irregularities. The "two-wheel" design facilitates end-for-end turns and similar maneuvers.

Bassick truck-locks firmly anchor these carts in a fixed position when desired.

Filter for Kodak... Mobility by Bassick

Bassick casters give mobility to this portable filter press. It's used to filter various ingredients in connection with the manufacture of photographic paper at Kodak Park Works, Rochester, New York—the largest manufacturing unit of the Eastman Kodak Company.

Bassick has a wide variety of casters for use under conditions of laboratory cleanliness. Some can be steam cleaned.

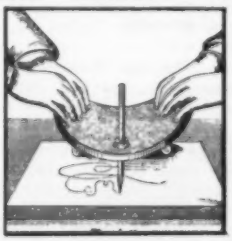
Tobacco Company Rolls Its Own

Bassick casters play a big part in the warehouse operations of this large tobacco company (which wishes to remain anonymous). Using caster-equipped dollies, handlers can quickly and easily move huge hogsheads and bales of tobacco from point to point, or load them on fork-lift trucks for longer hauls.

These simple materials-handling aids are equipped with rugged Bassick series "33" roller-bearing swivel casters. Series "33" casters are inexpensive, and they're ideal for industries—like tobacco—where the heat of drying ovens may prevent the use of ball-bearing swivel casters.

This is just one of the many casters available from Bassick. The wide Bassick line can almost always offer you a standard caster that's *exactly* right for your needs.

Easy Rolling "Ghost Writer"



This illustration of a planchette clearly shows a set of casters to aid in producing "spirit writing" when several people placed their hands on the device.

It just goes to show the enormous variety of jobs that casters can facilitate. See whether Bassick casters can speed up, make more convenient, or cut costs in, *your* operations.

Quality Casters Can Slash Maintenance Costs

Is your net profit caught in a squeeze between price and costs?

Maintenance is a big cost item in many plants, warehouses, stores and institutions. Bassick casters can help you reduce maintenance in two ways: (1) the right Bassick caster gives longer service, cutting caster replacements, and (2) the right caster wheel will protect and save your floors.

See your Distributor

He carries a large selection of Bassick casters in stock for fast deliveries. And, if you have special materials-handling problems, he's in the best position to advise you because he sells from the widest caster line on the market. O.35

THE BASSICK COMPANY
BRIDGEPORT 5, CONN.
IN CANADA:
BELLEVILLE, ONT.

Sweet's

Symbol of SW Excellence

Bassick
A DIVISION OF
STEWART-WARNER CORPORATION

For more facts Circle 511 on Reader Service Card

NEW SOURCES OF SUPPLY—

WHERE?

ASK THE MAN FROM THE NORTHERN PLAINS

When you need parts, processing, assemblies, we can locate new sources for you. Northern Natural Gas Company, Omaha, Nebr., has catalogued for instant reference by electronic methods, information about the production capacity of thousands of plants in the Northern Plains. This detailed information has been gathered and tabulated by the private gas utilities of the area. Upon receipt of details regarding your requirements, we will be glad to suggest possible qualified suppliers located in the five state Northern Plains Area.

For Accurate Information about the Manufacturing Facilities available in the Northern Plains, write Randall Klemme, Vice Pres., Northern Natural Gas Company, Omaha, Nebraska, or call 34 6-7600.

This Unique Service Is Yours . . . Simply For The Asking

Serving the Northern Plains
Northern Natural Gas Company
General Offices: Omaha, Nebraska

ADVERTISERS' LITERATURE

Begins on page 214

Offered in ads received up to 5th of last month. To get items you want, circle numbers on Reader Service Card next to back cover.

341—Conveyor Belt. Bulletin M303 illustrates belt engineered for 45-degree idlers. Raybestos-Manhattan, Inc.

342—Hoists. Here's information on line of electric, air, and other hoists, chain blocks. Shaw Box Crane & Hoist Div.

343—Conveyors. Manual on modern warehousing techniques gives examples of live storage. Rapids-Standard Co., Inc.

344—Casters, Wheels. Booklet lists all types for every kind of use and floor. Free on request. Darnell Corp., Ltd.

345—Pressure Grippers. Bulletin V-102 gives installation details, and describes specific case history. Whiting Corp.

346—Electric Trucks. General catalog lists line of fork, platform, and crane trucks. Elwell-Parker Electric Co.

347—Conveyors. This booklet tells about engineered conveyor systems to increase production, cut costs. Lamson Corp.

ELECTRICAL

348—Magnetic Contactors/Starters. Bulletin GEA7020 (20 pages) describes line—sizes 0 to 5. General Electric Co.

349—Safety Switches. Write for bulletin that gives construction, other data on visible switches. Square D Co.

350—Motors. Here are details on custom-built, air-cooled polyphase motors, 50 or 60 cycles. Valley Electric Corp.

351—Precision Switches. Catalog 83 covers "E6" enclosed switches in side- and bottom-mount models. Micro Switch.

352—Adjustable Speed Drives. Bulletin 6806 describes features of mechanical adjusted drives. General Electric Co.

353—Control Relay. Publication ED-L079-S211 gives details of new "300 V." control relay. Cutler-Hammer, Inc.

354—Load Control. Here's a book that describes unit for equipment protection. Machinery Electrification, Inc.

Come to Chicago . . .

For the 1961 Plant Maintenance and Engineering Show and Conference, Jan. 23-26. See exhibits by over 350 companies, hear over 50 experts at the conferences.

ELECTRICAL SYSTEMS LIBRARY

Whether you want current for a fan or an elevator—for a private residence or an office building—here is a complete working guide to help you get the most efficient and economical design. This practical library on electrical systems gives you easy access to today's best design methods, electrical theory, and proved system layouts. It helps you more easily solve electrical design problems in commercial, industrial, institutional, and residential buildings. Over 600 wiring diagrams, schematics, and detail drawings help make this library your standard guide to modern electrical design.

ELECTRICAL SYSTEMS DESIGN. Presents theory and methods for designing complete electrical systems. **By J. McPartland & Editors of Elec. Constr. & Maintenance. 2nd Ed., 208 pp., 187 illus., $7.75**

ELECTRICAL DESIGN DETAILS. Gives idea-sparking wiring diagrams, schematics, detail drawings. **By J. McPartland & W. Novak, Assoc. Editors, Elec. Constr. & Maintenance. 228 pp., 487 illus., $8.50**

Two Vols. $16.25—Pay $6.25 in 10 days; $5 a month for 2 months.

MOTOR SELECTION AND APPLICATION

Clearly and simply presents information necessary to properly select and apply electrical motors for industrial use. **By C. Libby, Fairbanks, Morse, & Co. 480 pp., 200 illus., $13.50**

INFRARED RADIATION

Just Out. Analyzes a typical infrared system, discusses its components, shows how it operates. **By H. Hackforth, Northronics, Div. of Northrop Aircraft, 280 pp., 172 illus., $10.00**

INDUSTRIAL ACCIDENT PREVENTION

A Scientific Approach

Outlines effective accident prevention procedures. **By H. Heinrich, formerly The Travelers Insurance Co.; and E. Granniss, The Royal-Globe Insurance Group. 4th Ed., 496 pp., 146 illus., $9.00**

FREE EXAMINATION

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327 W. 41st St., New York, 36, N.Y.
Send me book(s) checked below for 10 days' examination on approval. In 10 days I will remit for book(s) I keep plus few cents for delivery costs, and return unwanted book(s) postpaid. (We pay delivery costs if you remit with this coupon—same return privilege.)

- ☐ McPartland & Novak—**Elec. Sys. Lib.**, $16.25
  - ☐ **Elec. Systems Design**, $7.75
  - ☐ **Elec. Design Details**, $8.50
- ☐ Libby—**Motor Selec. & Appl.**, $13.50
- ☐ Hackforth—**Infrared Radiation**, $10.00
- ☐ Heinrich & Granniss—**Ind. Acc. Prev.**, $9.00

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Company .....
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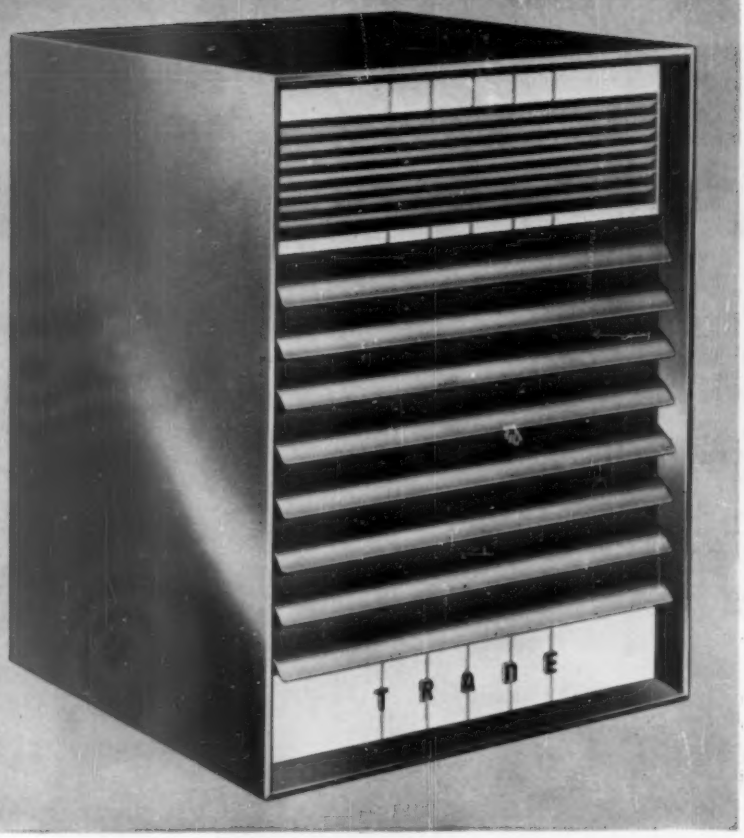


Duct heater is suitable for downstream operation in accordance with latest codes. Provides heating cycle for remote cooling units, such as the TRANE Self-Contained Air Conditioner. Drain pan (shown in inset) is standard equipment. The unit has low static resistance, is of aluminized construction. Operational modulation valve reduces input as much as 80%. 2-stage, 2-input valve available.

Propeller-type heater uses a new, quiet TRANE Fan that is designed exclusively for unit heaters. Access door on bottom of casing makes unit easy to clean. Complete range of sizes from 33,000 to 250,000 Btuh input.

New Trane gas-fired heaters have advanced styling, compact design!

High-performance blower and propeller units—plus duct models approved for downstream operation

Here's a new line of gas-fired heaters from TRANE that combines smart, modern appearance with peak performance and versatility! These TRANE Heaters are ruggedly built for long life—yet they're light in weight, compactly designed for use where space is at a premium.

Three basic types are available: propeller, duct and blower. All models feature an aluminized steel, all-welded heat exchanger that assures long, trouble-free operation. The steel, ribbon-type burners have stainless steel inserts. And the burners are removable individually for service and maintenance.

The TRANE Duct Heater may be used for downstream operation, for use with remote cooling units (such as the TRANE Self-Contained Air Conditioner). All parts of the duct heater that are exposed to the cold air stream are of aluminized construction—including the drain pan, which is standard equipment.

True 2-speed, 2-input propeller units available in 5 sizes. The motor speed and gas input can be automatically cycled to maintain more even temperatures; to provide greater operating economy.

The light weight of these new TRANE Heaters means more Btu's per pound. Freight costs are lower; and installation is simplified: minimizes the need for expensive structural reinforcement.

WANT MORE FACTS on these gas-fired heaters? Just ask your nearby TRANE Sales Office; or write TRANE, La Crosse, Wisconsin.

Blower-type heater uses a forward-curved centrifugal fan. Free delivery or duct work installation; adjustable fan belts to provide proper air delivery against varyi ɾ static pressures. Streamlined fan inlet for exceptionally quiet operation. Louver-Fin Diffusers increase air throw. Sizes from 33,000 to 250,000 Btuh input.

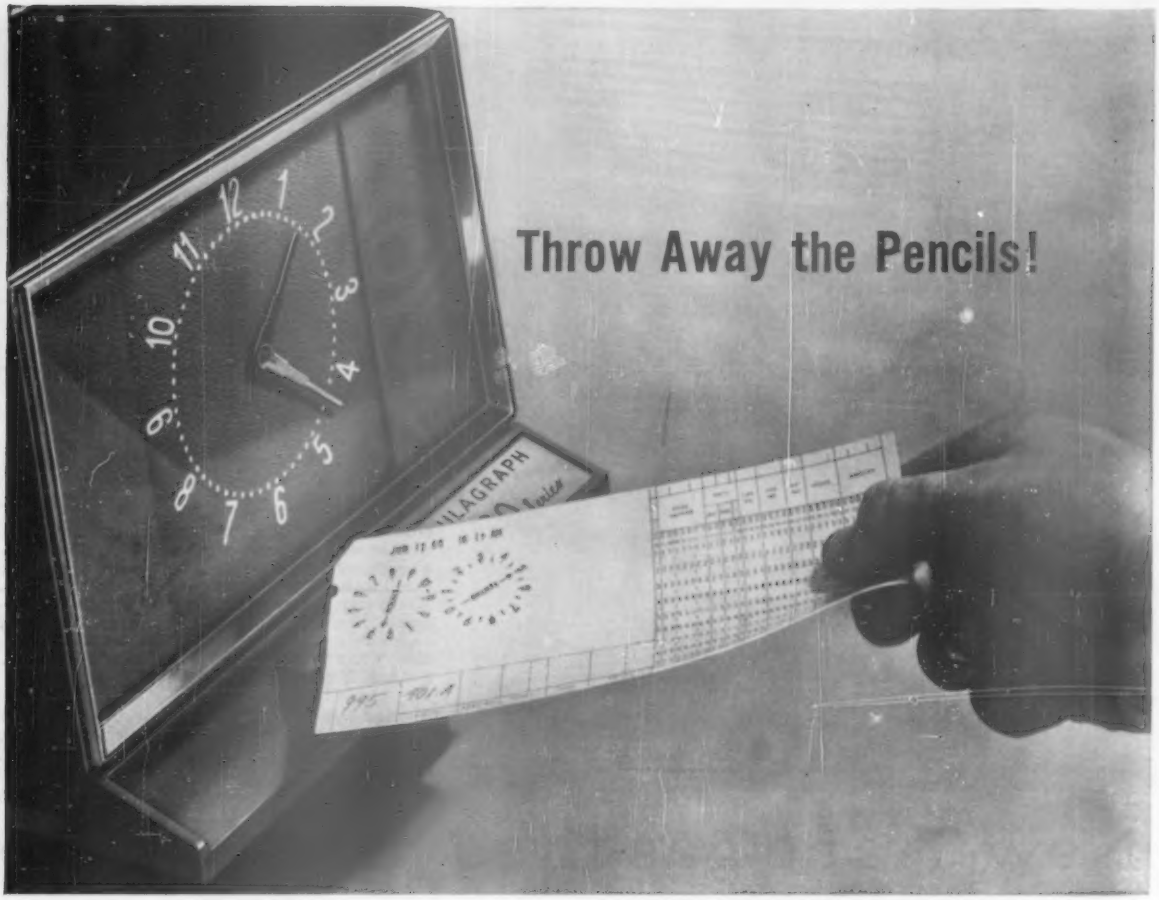
For any air condition, turn to

TRANE

MANUFACTURING ENGINEERS OF AIR CONDITIONING, HEATING, VENTILATING AND HEAT TRANSFER EQUIPMENT

THE TRANE COMPANY, LA CROSSE, WIS. • SCRANTON MFG. DIV., SCRANTON, PA. CLARKSVILLE MFG. DIV., CLARKSVILLE, TENN. • TRANE COMPANY OF CANADA, LIMITED, TORONTO • 100 U. S. AND 19 CANADIAN OFFICES

For more facts Circle 513 on Reader Service Card



Calculagraph 500 Series automatically computes actual labor time — eliminates error-ridden manual methods.

Your data collection system can be greatly simplified and attain greater accuracy with the new 500 Series Calculagraph because this completely new computing time recorder, based on the time-tested Calculagraph principle, computes as well as prints the actual time worked on any given production job. There are no complicated levers or buttons to set. The 500 Series makes the decisions. Production workers merely insert job cards at the "start" and "finish" of the job. The 500 Series does the rest. The actual time worked, with nonworking periods automatically deducted, is printed on the job card and ready for processing.

The 500 Series dovetails easily with any internal data processing system or outside service center. In smaller systems where the volume does not justify the use of machine accounting, this new computing time recorder can be a system in itself.

Investigate this new 500 Series now. Write or call for more details and, if possible, send us samples of your job cards for analysis.

INDUSTRIAL DIVISION

CALCULAGRAPH Company

273 Ridgedale Avenue, Hanover, New Jersey

For more facts Circle 514 on Reader Service Card

Photo Courtesy Bell Helicoptor Corporation, Ft. Worth, Texas

TUFFY GIVES SLING USERS A "LIFT"

in operating efficiency and economy

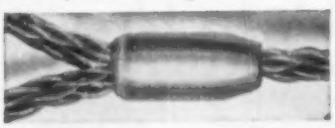
What else gets a lift with Tuffy? Just about everything. In every industry where loads are lifted, lowered, pulled or towed. On land and sea and even (as the picture suggests) in the air.

Jobs done by slings and hoist lines vary greatly. That's why Tuffy engineers have specialized in tailoring Tuffy products to specific uses.

Because of this specialization, Tuffy assures you the right sling for the job. Gives you better sling performance, greater safety and longer service life. In the long run, the ultimate low cost sling is Tuffy.

Don't take less than these Tuffy advantages . . .

Tuffy's secret of longer life: patented 9-part machine-braided fabric. It provides a combination of flexibility and strength never achieved by ordinary wire rope. Amazing resistance to kinks, which smooth out easily when they do occur.



An eye for strength and safety: Tuffy's metal ferrule gives the eye splice full strength of the fabric. That's because it's pressed on under tremendous hydraulic power. What's more, the smoothly tapered body won't snag hands. A Tuffy extra at no extra cost.

Get in Touch with Your Tuffy Distributor

Whether your sling jobs call for the Tuffy machine-braided sling, or Union's new 6- and 8-part hand-braided slings, your Tuffy distributor gives you by far the best buy. And he's famous for fast service on every sling and wire rope need. Look him up in the Yellow Pages.

Tuffy® Tips

—on safe use of

Slings and Hoist Lines

Lifting Strains Take High Toll of Injuries

Did you know that in some states one of every six compensation claims involves back injuries? And that one major insurance company says back injuries constitute 60% of their claim expense?

Hernia is another hazard of materials handling. One manufacturer reported 75% of his compensation claims involved hernias. This high incidence of hernias and back injuries can be greatly reduced by proper lifting equipment and methods.

How to Play It Safe When Loading Slings and Hoist Lines

1. Keep pull on sling legs in a straight line never shorten legs with knots or I-bolts. If choker and basket hitches are used on slings, check rated load limits.
2. Load slings on the center of hooks. Never at their points, except for hooks specially designed for point loading.
3. Never use load hooks that are bent open. They have been overloaded, and may drop loads with disastrous results. Same goes for defective chain blocks. Insist that your men report them at once.
4. Lubricate wire ropes at regular recommended intervals, with lubricant advised by your local oil company engineer.

FREE!
New Tuffy
Sling Handbook

All about slings from A to Z, including types, dimensions and rated loads. Address **Union Wire Rope Corporation, 2234 Manchester Ave., Kansas City 26, Missouri.** Specialists in high carbon wire, wire rope, braided wire fabric, and stress relieved wire and strand.

6

UNION Wire Rope

ARMCO®

Subsidiary of ARMCO STEEL CORPORATION

OTHER SUBSIDIARIES AND DIVISIONS: Armco Division • Sheffield Division • The National Supply Company
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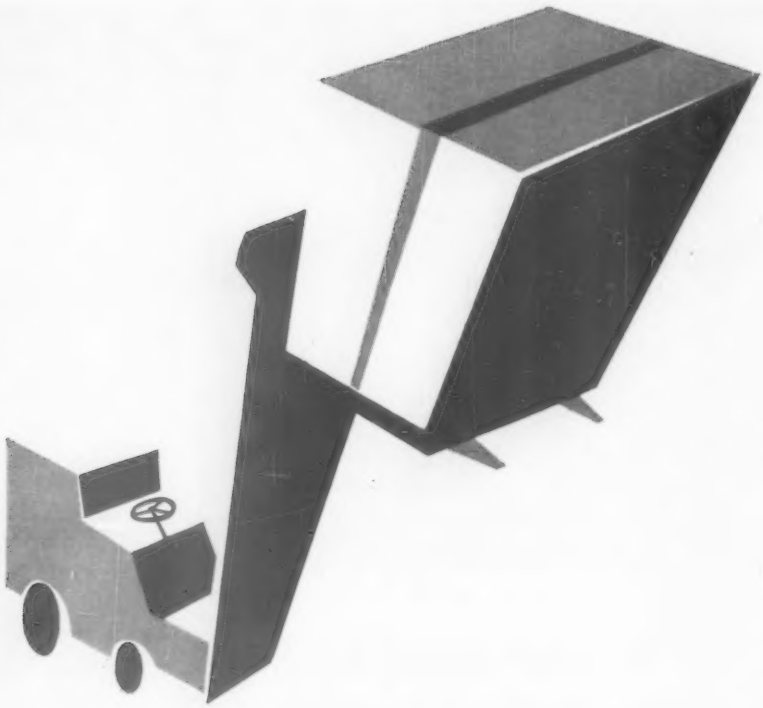


Now! A low-cost way to automate inventory control–

Keysort® Data Processing

Fast accurate inventory control is at your fingertips with low-cost Keysort Data Processing.

Hundreds of plants are using this modern method to obtain up-to-the-minute information on inventory and in such other vital areas of plant control as labor costing, operation costing and production control.

Fits any size plant

Keysort has many advantages. No restrictive procedures, minimum training, remarkable economy, simplicity of installation and operation. In fact, Keysort is the only automated data processing system flexible enough to fit your plant as it stands *and* as it grows. And at a cost well within your company's budget.

Cuts clerical work

With Keysort you use easy-to-handle punched cards – mechanically created for rapid sorting and classification. Results are automatically tabulated and summarized direct, to give you the meaningful on-time information you need for complete control of your plant and your profits.

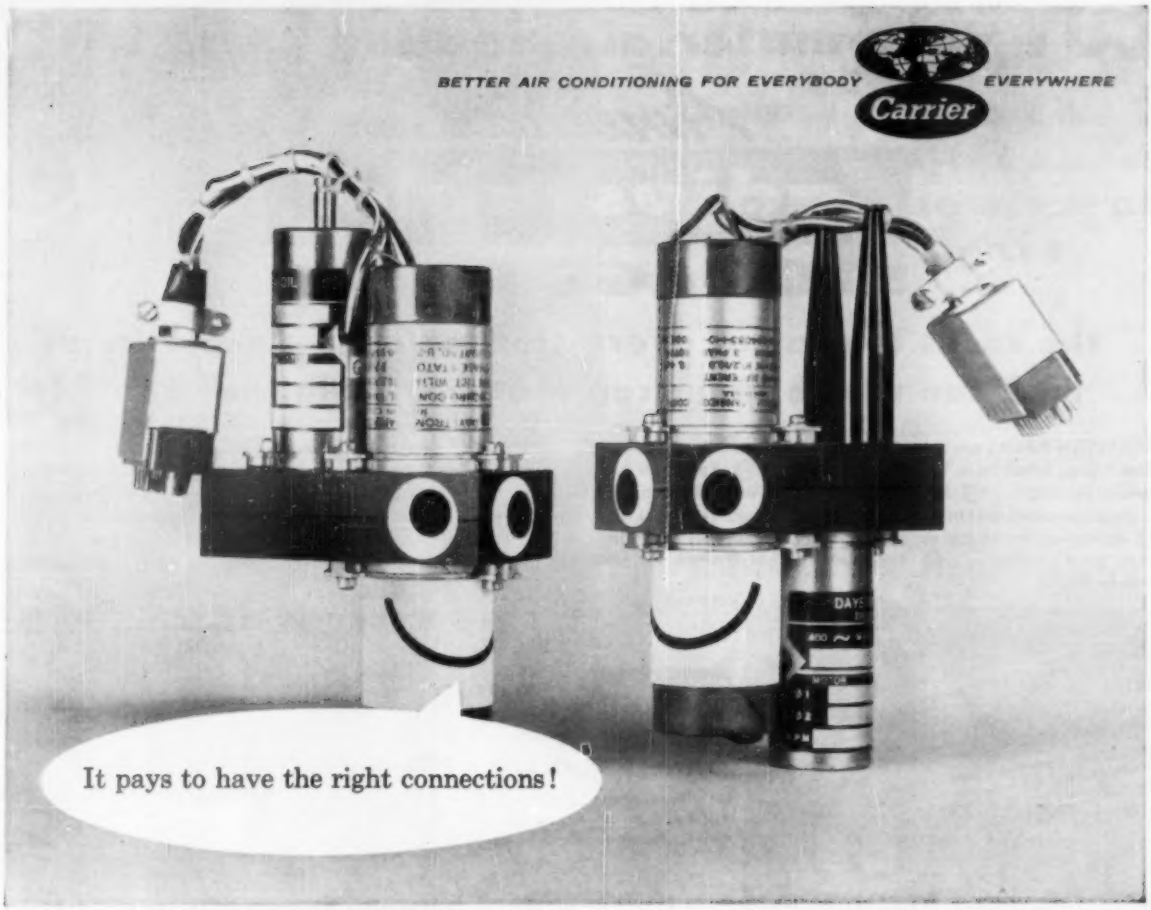
Ask us for case histories

Your nearby Royal McBee Data Processing Systems Representative has had a wealth of experience in solving plant control problems. Working with your plant managers and foremen, with your systems and procedures experts, he can offer helpful advice about the low-cost Keysort system tailored to your individual requirements. Call him, or write us at Port Chester, N. Y.–indicating the applications in which you are interested – and we will be happy to supply you with actual case histories from our files.

ROYAL McBEE *corporation*

NEW CONCEPTS IN PRACTICAL OFFICE AUTOMATION

For more facts Circle 516 on Reader Service Card



DAYSTROM EARNS 41% ANNUAL RETURN ON CARRIER AIR CONDITIONING INVESTMENT

Factory air conditioning increases productivity, as many managements are proving. But is quality air conditioning required to bring about this happy situation? Or is any air conditioning good enough?

One manufacturer able to answer these questions from both sides of the fence is Daystrom, Inc., producer of servo-mechanisms that keep U. S. missiles, rockets and aircraft on course and on target.

Four years ago its Transicoil Division moved into a windowless plant in Worcester, Pennsylvania. Air conditioning was specified—but not what kind. The system proved inadequate. Summer production suffered. Two hours per worker were lost on many days. The plant had to shut down on others. And absenteeism was high.

Daystrom management soon decided that poor air conditioning was worse than none. Carrier was called into the picture. The system was reengineered and new Carrier equipment was put on the job. The result? Everything management had originally hoped for—and then some.

Summer output was so high that annual productivity increased 2.7%. Rejects were cut 5%. Labor turnover dropped 25%. Absenteeism was virtually eliminated. And increased work output is giving the company an annual return of 41% on its investment, including original installation cost.

Will factory air conditioning pay off for you? The coupon below will bring you a booklet describing four important yardsticks. Write for it today without obligation. Carrier Air Conditioning Company, Syracuse, N. Y. In Canada: Carrier Air Conditioning Ltd., Toronto.

To Carrier Air Conditioning Company, Syracuse, N. Y. I am interested in receiving your booklet, "Will factory air conditioning pay off for me?"

Name _____

Company _____

Address _____

City _____ State _____

For more facts Circle 517 on Reader Service Card

CUT your material handling costs with

American adjustable STORAGE RACKS

the racks that meet every storage need...no other rack can match American features...no, not one!

AMERICAN RACKS are America's choice because . . . ❶ American Stringers are one-piece, made of durable, continuous welded steel tubing made from high carbon steel . . . ❷ American Posts are rugged—made from extra heavy gage steel, roll-formed by special tooling . . . ❸ American has the highest safety factor of any leading rack manufacturer—this means greater protection to truck operators and merchandise . . . ❹ American Racks are easy to erect—no costly bolting—all parts hook into place . . . . . ❺ American Racks are easy to adjust—all stringers move independently of any other part—they raise and lower like a window, on 4" centers . . . ❻ American Upright Frames are cross-braced against sway—turnbuckles provide ready take-up for uneven floors.

American Slide-n-Lock Rack installation, Holt, Rinehart & Winston, Inc., Clifton, New Jersey

← **American Slide-n-Lock selective type storage racks**

for all types of merchandise—whether light packages or heavy metal products.

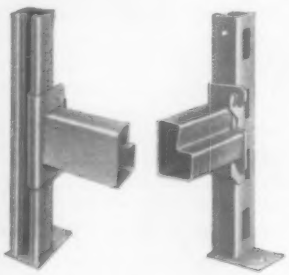
American Open-End drive-in type storage racks →

make aisle space storage space...ideal for bulk storage.

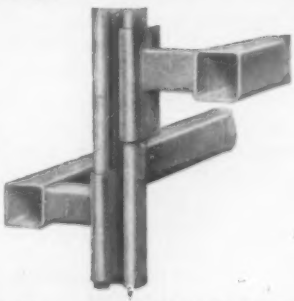
American Open-End Rack installation, Bissell, Inc., Grand Rapids, Michigan

send for catalog

LEFT—smooth line construction of aisle side of post and stringer eliminates hazardous protrusions. RIGHT—note rigid connection when stringer is "locked" to post. →



→ Sturdy, load-carrying stringers are made of rugged square tubing from one end of a row to the other. The American trigger-quick, slide-n-lock method of assembly saves time and money.



AMERICAN METAL PRODUCTS COMPANY

STORAGE RACK DIVISION

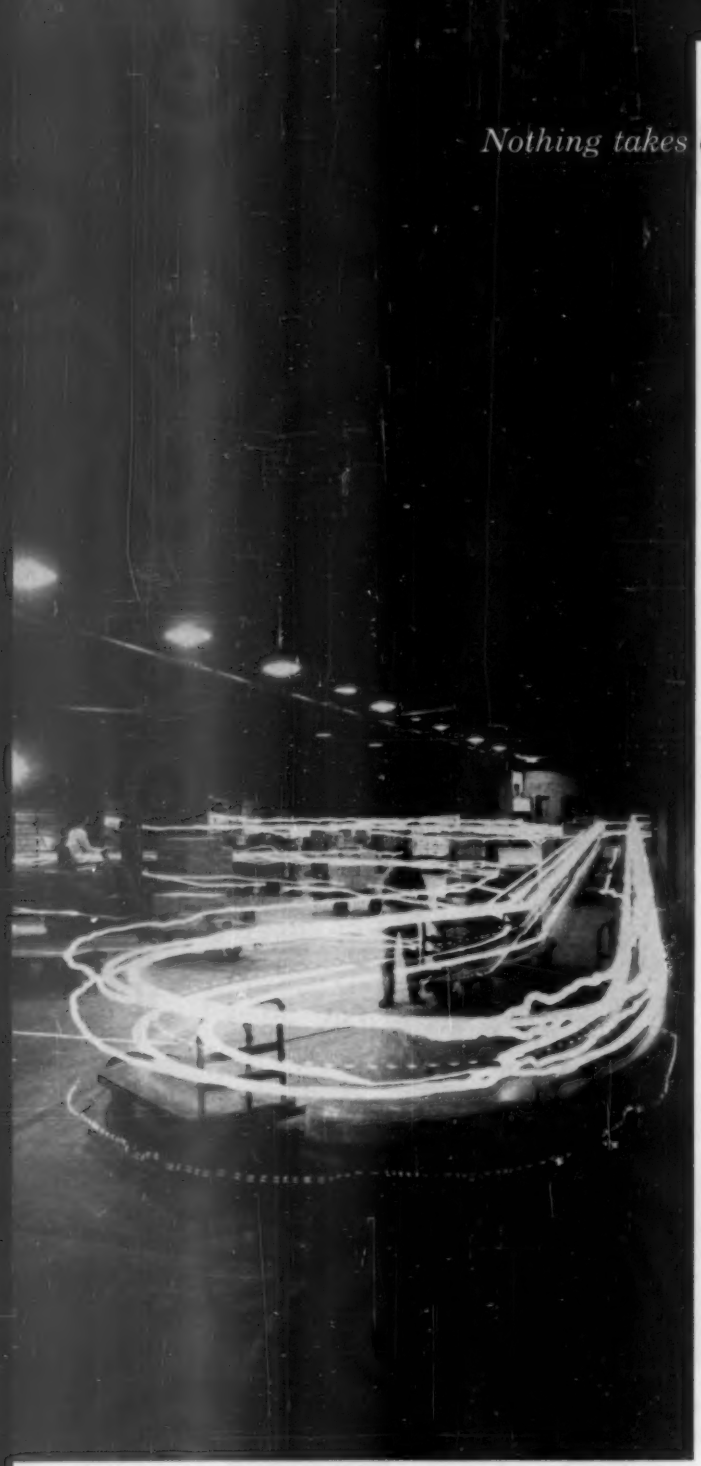
5965 Linsdale Ave. amp® Detroit 4, Michigan

Manufactured in Canada by Sunshine-Waterloo Co., Ltd., Waterloo, Ontario

For more facts Circle 518 on Reader Service Card

For more facts Circle 519 on Reader Service Card ➤

Nothing takes a bigger beating than your floors . . .



2½ tons of food a minute batter these floors . . . no sign of wear in 5 years

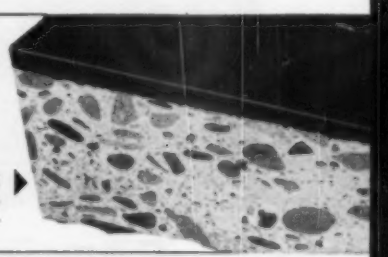
Associated Grocery, Inc., Dallas, took no chances. They installed the best . . . MASTERPLATE "iron-armoured" floors—for only pennies per square foot more.

Some 300 conveyor trucks, 8 fork lifts and 22 "tuggers"—handling over 2,400,000 pounds of foodstuffs a day—grind away without any sign of floor wear. And because malleable MASTERPLATE floors don't shatter and dust—goods go out *clean*.

Associated found real economy in MASTERPLATE floors, and that's not all. They can count on MASTERPLATE to deliver from four to eight times longer wear than the best plain concrete floor . . . no costly repairs or replacement because MASTERPLATE floors are tough enough to take it.

Before *you* install or replace another floor, call in the local Master Builders field man for full information on this unique "floor package"—a *superior product*—MASTERPLATE . . . plus *on-the-job* service by a skilled Master Builders field man.

The Master Builders Company
Division of American-Marietta Co.
Cleveland, Ohio
World-wide manufacturing and service facilities


MASTERPLATE provides a thick . . . tough . . . malleable "iron-armoured" floor surface.
CONCRETE BASE SLAB FOR MASTERPLATE surface can be monolithic or two-course.

FOR FINISHING NEW CONCRETE FLOORS or re-surfacing old concrete floors—MASTERPLATE withstands impact and abrasion . . . is oil resistant and virtually non-absorbent . . . easy to clean . . . non-dusting . . . resistant to many industrial corrosives and strong cleansers . . . *and outwears the best plain concrete floor 4 to 8 times*, according to tests by top independent testing authorities.

TRACER LIGHTS show heavy traffic flow pattern along "towveyor" line and on truck-loading dock at Associated Grocery, Inc., Dallas, Texas • Douglas Simril, General Manager • Consulting Engineers: Mullen and Powell • Contractor: Carpenter Bros. • Floor Contractor: Mobley and Speed—all of Dallas, Texas.

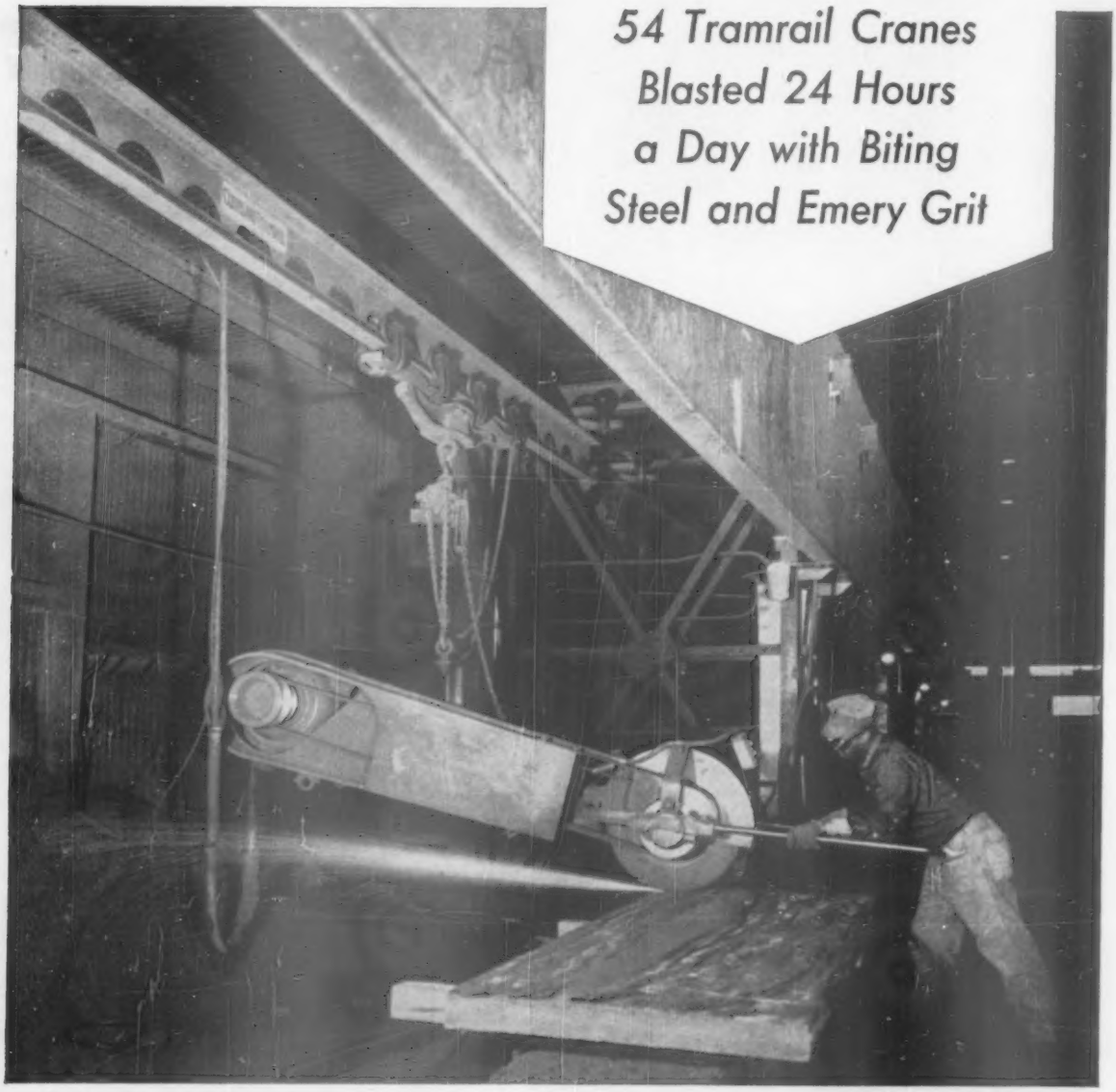
Our 50th Year

MASTER BUILDERS®
MASTERPLATE*

MP-2006

*MASTERPLATE *is a registered trademark of The Master Builders Co. for its specially prepared, metallic aggregate for producing "iron-armoured" concrete floors.*

Talk About *Tough* Working Conditions



54 Tramrail Cranes Blasted 24 Hours a Day with Biting Steel and Emery Grit

FOR years Cleveland Tramrail cranes have been handling swing grinders at a large Pennsylvania steel mill.

Despite the continuous storms of fine, penetrating, corrosive dust, the cranes operate with negligible maintenance.

The design and quality of Cleveland Tramrail equipment is of importance for every job, but on the tough ones like this is where these factors quickly prove their worth.

Cleveland Tramrail cranes are particularly well suited for swing grinder operation because of their free easy movement in any direction. This permits flat grinding over a wide area and avoids "dishing" of grinder wheel into the metal. Easy crane operation greatly reduces worker fatigue.

Write for free Engineering and Application Booklet No. 2008. Packed with valuable information.

CLEVELAND TRAMRAIL

Overhead Materials Handling Equipment

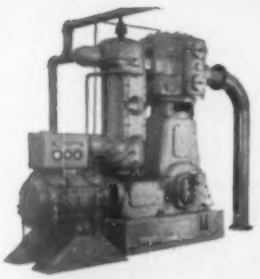
CLEVELAND TRAMRAIL DIVISION • THE CLEVELAND CRANE & ENGINEERING CO. • 3221 E. 290 ST • WICKLIFFE, OHIO

For more facts Circle 520 on Reader Service Card

FACTORY

Which... ATLAS COPCO COMPRESSOR

meets your needs best?



AR Heavy-Duty Compressors

More air per horsepower than any comparable compressor! For continuous, full-load operation. "L" angle, 2-stage, double acting. Water cooled. Standard models provide 382 to 3210 cfm free-air delivery at 100 psi; only 76-590 hp required! (Can be supplied for other working pressures on request.)

What's your compressor requirement? Need an installation large enough to provide air for all your needs? Or would a small, compact unit for auxiliary operation solve your immediate problem? Either way—and for a wide range of applications between these extremes—Atlas Copco has the compressor for you!

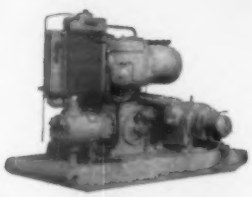
No matter which you choose, you'll get these proven advantages from Atlas Copco:

(1) More air per horsepower—less power consumption than other comparable units!

(2) Really low maintenance (one example—$3.10 after 10,000 hours' operation)!

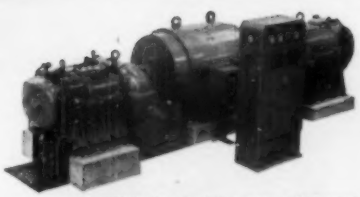
(3) Specifications are guaranteed free-air delivery—you get exactly what you order!

Get all the facts now—and compare! The coupon below will bring you a free catalog. (No obligation, of course.)



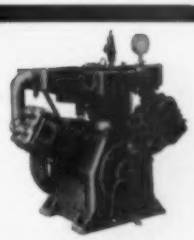
AR-L Heavy-Duty Compressors

Same basic construction as the AR Series, but provided with an air-cooled intercooler and air-cooled radiator for the cylinder water. Fan on compressor flywheel cools radiators. Perfect for arid areas or where difficult to bring in water. Both stationary and skid-mounted models available.



TWIN-AIR Rotary Screw Compressors

Brand new! "Twin-Air" Compressors offer capacities from 6,900 to 19,400 cfm at working pressures up to 115 psi. And, you get completely oil-free delivery of air or gas, since no lubrication is required — timing gears maintain small clearances between precision-mounted rotors, eliminating friction (and the necessity of oil) in compression chamber.



CT Air-Cooled Compressors

Stationary, or skid-mounted compressors for use where air demand is between 50 and 300 cfm. Totally air-cooled. Cylinder arrangement designed for smooth, vibration-free operation. Compact, rugged—for continuous, 24-hour trouble-free service. Highly efficient; low on maintenance costs.

ER-6 Heavy-Duty Compressors

New! Fundamental improvements over conventional heavy-duty compressors reduce power requirements (18.3 hp/100 cfm at 100 psi, full load); provide totally enclosed design; and save on floor space. Capacities to 1,140 cfm; standard instruments and safety devices.

ATLAS COPCO
Dept. F-5, 545 Fifth Avenue,
New York 17, N.Y.

Gentlemen:
Please send me ☐ Short-form catalog ☐ Detailed information on the _____ Series

Name _____ Title _____

Firm _____

Address _____

City _____ Zone _____ State _____

Atlas Copco

610 Industrial Avenue
Paramus, New Jersey
COlfax 1-6800

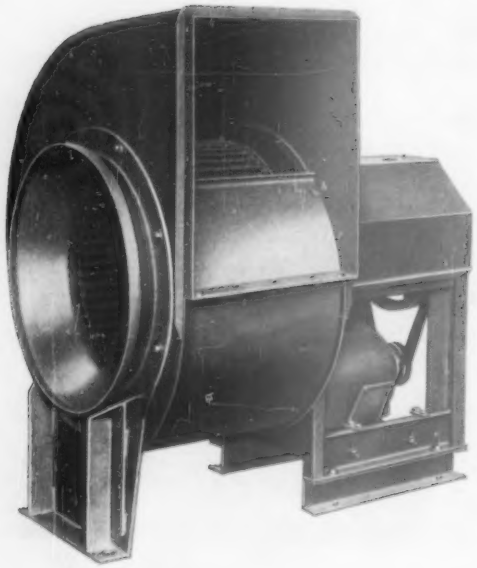
930 Brittan Avenue
San Carlos, California
LYtell 1-0375

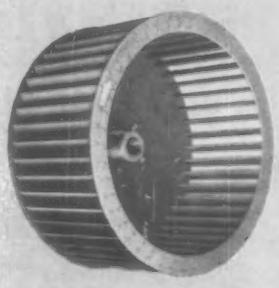
CLARAGE

New line of

V-belt driven

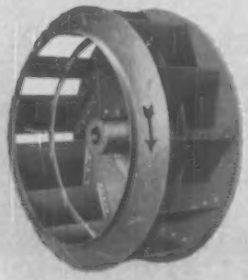
Ready Units





LS Ready Units have Low Speed, forward curved blade wheels. These are of the long-recognized Clarage Type HV multiblade design.

or



MS Ready Units have Medium Speed, backward inclined blade wheels with non-overloading horsepower characteristic. These are of the highly regarded Clarage Type NH, Class I design.

Exceptionally sturdy, quiet, ready-to-run fan sets

- for volumes up to 25,000 CFM
- for static pressures thru 2½″
- for clean air up to 300° F.

Distinguishing points — over 15 of them — make these new Clarage units outstanding.
To mention a few: Better motor ventilation . . . entire drive within frame of unit . . . complete accessibility to motor, drive, and bearings. Learn more about the numerous specific advantages that mean greater value to you from Clarage. Request Catalog 517 . . . 36 pages of complete information, selector charts, capacity tables, dimensions.

Clarage Ready Units are ideally suited for supply or exhaust jobs — indoors or outdoors — for buildings of all types, all sizes.

Write for your Copy

Dependable equipment for making air your servant

CLARAGE FAN COMPANY

Kalamazoo, Michigan

SALES ENGINEERING OFFICES IN ALL PRINCIPAL CITIES • IN CANADA: Canada Fans, Ltd., 4285 Richelieu St., Montreal

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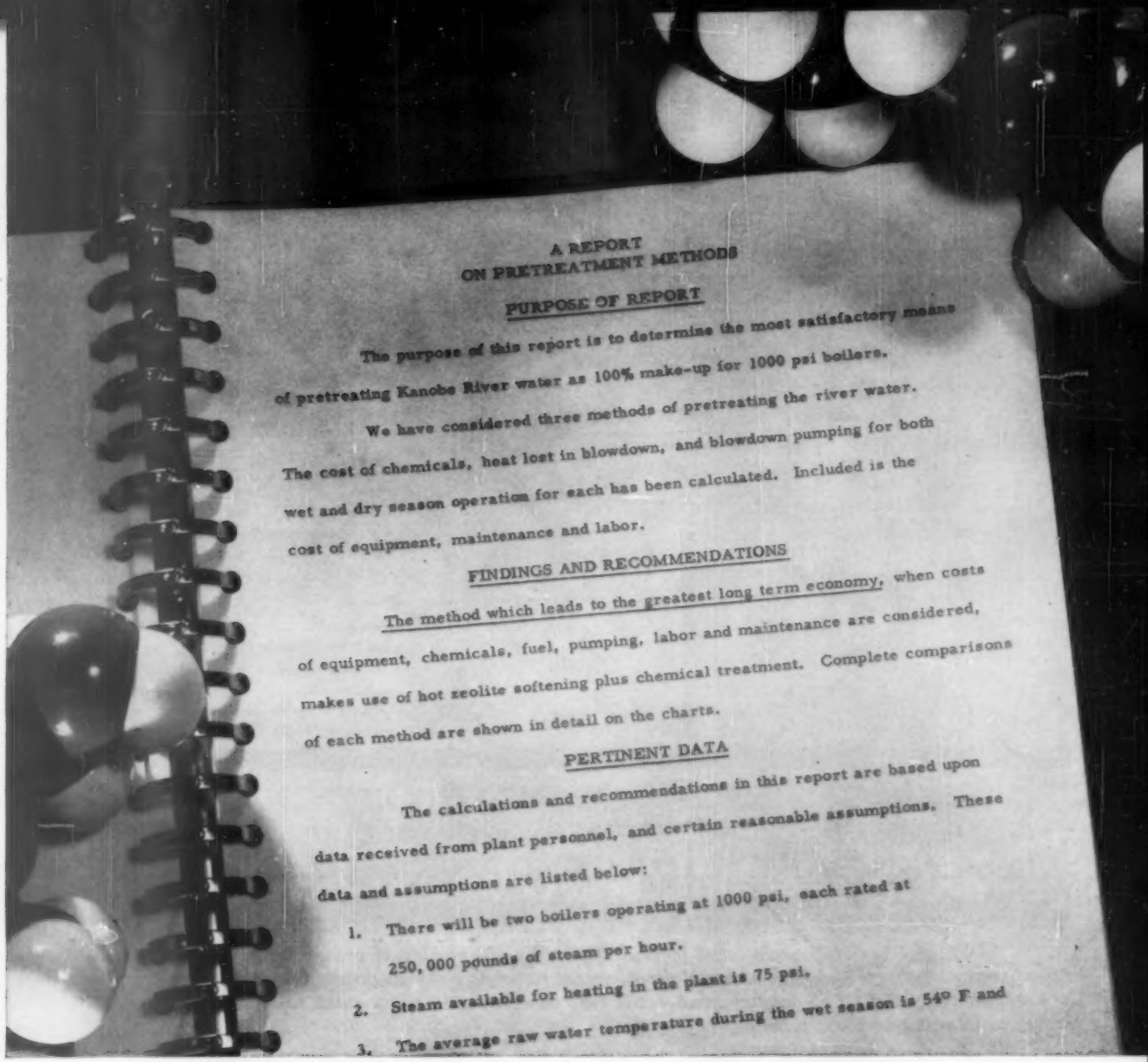
A REPORT
ON PRETREATMENT METHODS
PURPOSE OF REPORT
The purpose of this report is to determine the most satisfactory means of pretreating Kanobe River water as 100% make-up for 1000 psi boilers.
We have considered three methods of pretreating the river water. The cost of chemicals, heat lost in blowdown, and blowdown pumping for both wet and dry season operation for each has been calculated. Included is the cost of equipment, maintenance and labor.
FINDINGS AND RECOMMENDATIONS
The method which leads to the greatest long term economy, when costs of equipment, chemicals, fuel, pumping, labor and maintenance are considered, makes use of hot zeolite softening plus chemical treatment. Complete comparisons of each method are shown in detail on the charts.
PERTINENT DATA
The calculations and recommendations in this report are based upon data received from plant personnel, and certain reasonable assumptions. These data and assumptions are listed below:
1. There will be two boilers operating at 1000 psi, each rated at 250,000 pounds of steam per hour.
2. Steam available for heating in the plant is 75 psi.
3. The average raw water temperature during the wet season is 54° F and

They planned for minimum water costs...

by calling on the wide ranging experience that is one of Hall Laboratories' major assets.

Look at the report quoted above, prepared for a leading chemicals company. Hall drew upon intimate knowledge of water conditions and boiler characteristics to come up with a recommendation that will provide the best treatment method at the lowest, long-term cost.

Hall experience is by no means limited to boiler water treatment. The same realistic approach, based on firing-line information and aimed at efficient, low-cost water usage, is available on any of the multitude of ways water is employed in industry.

Hall Laboratories can help you find how to save money on water—your most important raw material.

HALL LABORATORIES

HAGAN CENTER, PITTSBURGH 30, PA.

Consultants on Procurement, Treatment, Use and Disposal of Industrial Water

Write for new booklet describing Hall Laboratories' plant-wide water services.

DIVISION OF **HAGAN** CHEMICALS & CONTROLS, INC.

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UNIT-COLES
UNIT-COLES
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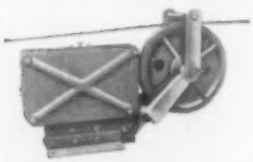
UNIT-COLES

■ *the world's* ■
■ *safest crane* ■



YOU CAN'T OVERLOAD THIS CRANE!
This Automatic Safe Load Controller weighs each load — visually and audibly warns operator attempting unsafe lift — automatically stops and holds hoist motions if warnings are ignored.

CLOSE-QUARTER WORKABILITY *WITH INDEPENDENT ELECTRIC POWERING OF* **ALL** *MOTIONS FOR* SWIFT, SAFE PICK-N-CARRY HANDLING

■ *This Midwestern metal fabricating firm has the problem of moving heavy, cumbersome sections from its structural and fabricated steel department to out-of-door storage areas. Chosen for the job is this self-propelled UNIT-COLES mobile crane — the only rig offering so many outstanding advantages essential to swift, safe pick-n-carry handling.*

UNIT-COLES' cantilever-type boom, with its low overall height, makes this crane ideal for in-plant pickups and for moves through low clearance doorways. Tail swing and turning radius are shortest of any American-made full-circle revolving crane, enabling a **UNIT-COLES** to travel and swing a full 360° in a narrow 12-ft. aisle. Electrically-driven independent swing and travel plus instinctive steering control — "left-for-left" and "right-for-right" with cab in any position — provide unlimited maneuverability in the tightest spots. Load-hoist and boom-hoist are actuated by fast, smooth, positive electric power . . . can be operated simultaneously or individually while the crane is in motion. Automatic braking on all crane motions plus automatic protection against over-travel of boom and block constantly protect men, machine and load. There's so much more you should know about a **UNIT-COLES**. Why not call your dealer soon for an analysis of your handling requirements? In the broad line of **UNIT-COLES** cranes — capacities range from 5 to 55 tons — there's the exact size machine to match your needs.

UNIT

UNIT CRANE & SHOVEL CORP.

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Milwaukee 19, Wisconsin

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for Production, Materials Handling and Packaging

Veeder-Root Electro-magnetic Counters provide new and simplified methods for controlling all types of plant operations.

These counters are actuated electrically by a variety of methods as shown above, making them completely flexible in application. These methods include non-contact probes and photocells, miniature switches and built-in "make and break" or standard contact switches. In addition, these electro-magnetic counters can be easily remoted — at any distance — to office locations or for centralized production control.

Send for complete information on Veeder-Root Electric Counters . . . Take advantage of the many new opportunities for improved and simplified counter application, possible only with this Veeder-Root line.

Standard models available from your Veeder-Root Industrial Distributor; or write direct for help on specific problems.

A complete line of Electro-magnetic Counters

Series 1591 — Quick reset, high speed counter. Speed: 3000 cpm. Extra long life. 4 or 6 figures.

Series 1205 — Reset magnetic counter for base mounting. Speed: 1000 cpm. 6 figures.

Series 1507 — Small Reset Counter for base or panel mounting. Speed 700 cpm. 3 or 4 figures.

Veeder-Root

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"The Name that Counts"

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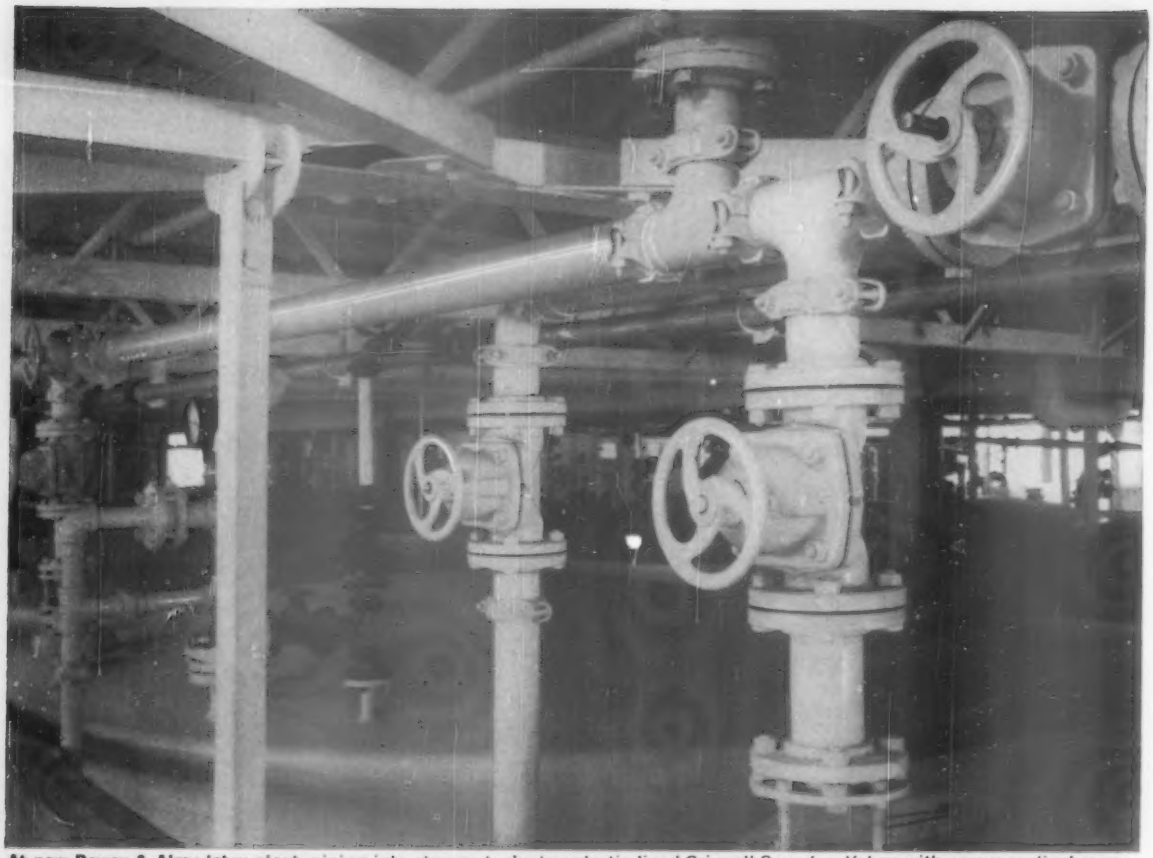
VRO-98



At new Dewey & Almy latex plant, piping into storage tanks has plastic-lined Grinnell-Saunders Valves with neoprene diaphragms.

At Dewey & Almy plant . . .

Grinnell-Saunders Diaphragm Valves guard against plugging, corrosion, contamination

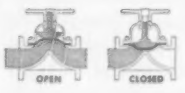
The new Owensboro, Kentucky plant of Dewey and Almy Chemical Division, W. R. Grace & Co., makes polyvinyl acetate emulsions and butadiene-styrene co-polymers for adhesives, paper coatings, emulsion paints and other products.

These co-polymers present several manufacturing problems: build-up of obstructions that plug lines, high viscosity that needs wide-open lines, easy hardening by the air.

Selected to handle this tough job: *Grinnell-Saunders Diaphragm Valves.* These rugged valves have a diaphragm that lifts high for streamline flow; seals tight for positive closure. Bonnet mechanism is completely isolated from material in the line by the diaphragm to prevent corrosion and contamination.

What's more, Grinnell-Saunders Diaphragm Valves give smooth passage of material . . . eliminate trapping of solids, reduce frictional resistance. You can choose from a number of body, lining and diaphragm materials.

Find out how Grinnell-Saunders Diaphragm Valves can help *your* installation. Write Grinnell Company, Providence 1, R. I.



Grinnell-Saunders Valves with stainless steel bodies and teflon diaphragms were specified for the reflux lines of this co-polymer reactor.

GRINNELL-SAUNDERS DIAPHRAGM VALVES

GRINNELL COMPANY, PROVIDENCE 1, R. I. • BRANCH WAREHOUSES AND DISTRIBUTORS FROM COAST TO COAST
PIPE FITTINGS • VALVES • PIPE HANGERS • PREFABRICATED PIPING • UNIT HEATERS • PIPING SPECIALTIES

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CAN COLOR CONDITIONING INCREASE YOUR PRODUCTION?

Yes. But let's ask a specialist like Bob Bird. Bob is one of Du Pont's staff of "Color Counsellors"—sales representatives whose years of experience and specific training qualify them to bring you expert, on-the-spot assistance in selecting the right paints in the right colors. Here's his answer:

"There's more to this question of effective maintenance painting than many people realize. Of course, it starts with the selection of top-quality finishes. My customers know their investment in Du Pont paints will pay off in terms of long-lasting protection and good appearance.

"But the job's only half done if you stop there. For maximum return on your maintenance dollar, Du Pont's system of Color Conditioning is a *must*. Tests show conclusively the power of color, scientifically applied, to make employees happier, safer and more productive. Du Pont Color Conditioning lets you harness this power to work profitably for you. By reducing absenteeism, boosting efficiency and promoting safety, Color Conditioning can literally increase your production!"

Bob Bird, or any of his counterparts throughout the country, would be happy to talk with you before you write your next paint specifications. For more information, plus the 28-page booklet, "How to Put Color to Work," write: E. I. du Pont de Nemours & Co. (Inc.), Finishes Division, Dept. F-612, Wilmington 98, Delaware.

* * *

R. H. Bird has developed plenty of problem-solving experience in the field of maintenance painting during more than 20 years with Du Pont's Finishes Division. Enthusiastic about its many possibilities for more efficient maintenance at lower cost, he has developed Color Conditioning programs tailored to meet the needs of a wide variety of schools, hospitals, churches, office buildings and industrial installations. A member of the Construction Specifications Institute, Bob works closely with architects drawing up paint recommendations.

DU PONT COLOR CONDITIONING PAINTS

DU PONT

Reg. U.S. Pat. Off.

BETTER THINGS FOR BETTER LIVING . . . *THROUGH CHEMISTRY*

WHO USES *Rubbair*®

the true door . . . not a curtain. *Doors?*

One of the Rubbair Door installations at the Arvida Works, Aluminum Company of Canada, Ltd.

ALUMINUM COMPANY OF CANADA, LTD

Arvida Works, Montreal, Canada

READ THIS ACTUAL CASE HISTORY:

". . . The Arvida Works of the Aluminum Company of Canada is the largest aluminum smelter in the world occupying an area of 1½ miles long by ¾ mile wide with a capacity of 362,000 short tons of aluminum ingot per annum. The Rubbair Doors separate our furnace lines from the remelt department and contribute considerably to maintenance of good housekeeping and the operation of our ventilating equipment. In every respect the Doors have proven satisfactory and maintenance costs are reasonable.

Aluminum Company of Canada, Ltd
PAUL CLARK

RUBBAIR DOORS recoil on impact without breaking, tearing or damaging valuable equipment. Withstands terrific pounding that wrecks ordinary factory or warehouse doors. They pay for themselves in maintenance savings.

RUBBAIR DOORS assure trouble free operation with . . .

- **Flexible Construction**
- **Rugged V-Cam Hinges**
- **Scuff-resistant Wear Panels**
- **Safety Cushion Nose**
- **Shatter-proof windows**
- **Positive Air Seal**

If you have an industrial door problem, let us help you solve it. Write us the details or ask for a free illustrated catalog.

Stic-Klip

® MANUFACTURING CO., INC.

RUBBAIR® DOOR DIVISION

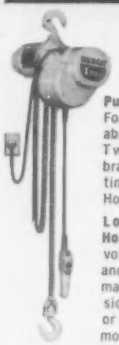
60 Regent Street

Cambridge 40, Mass.

Distributorships available in protected territories

CUT YOUR COSTS

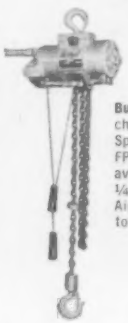
. . . let us help you save on every hoisting operation



ELECTRIC HOISTS

Push Button Budgit Electric Hoist. For regular hoisting service. Portable. Hang up, plug in, and use. Two fully enclosed automatic brakes give fast, accurate spotting. ½-ton model lifts at 34 FPM. Hook suspension. ½ to 2 tons.

Load Lifter Wire Rope Electric Hoists. ½ to 15 tons. Safe 24-volts at the push-button. Single and 2-speed control. Two automatic brakes. Lug or hook suspension; also with push, hand-geared or motor-driven trolley. Hi-hook model, too.



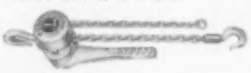
AIR HOISTS

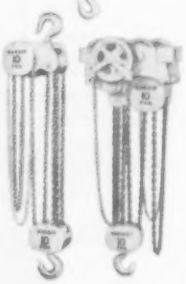
Budgit Air Hoist. Link and roller chain types. Pendant cord control. Speeds infinitely variable to 75 FPM. Rigid mount push trolley available. Safety hooks standard. ¼, ½ and 1 ton. Also Load Lifter Air Hoists with wire rope load line to 15 tons.

CHAIN BLOCKS

Budgit Chain Blocks. ¼ to 10 tons. Light, tough aluminum frame. 25 lb. pull on hand chain lifts 500 lbs. Fast action load brake makes lowering easy. Hook suspension or Army type trolley.

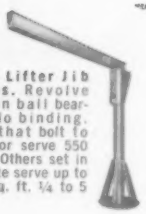
Tugit Lever-Operated Hoist. Light, compact, portable. Easy to operate even in close quarters — lifts or pulls at any angle. A fine maintenance tool. ¾ to 3 tons.





BUILD-IT-YOURSELF CRANE ASSEMBLIES

Budgit Crane Assemblies. Low-cost "build it yourself" kits to construct single girder cranes up to 6 tons and 30 ft. span without special tools. You buy I-beam locally to save more. Packaged electric bridge drive adds efficiency. Kits also for 180° swinging bracket jib cranes up to 4½ tons, 10 ft. reach.



Load Lifter Jib Cranes. Revolve 360° on ball bearings. No binding. Types that bolt to the floor serve 550 sq. ft. Others set in concrete serve up to 1500 sq. ft. ¼ to 5 tons.

END YOUR LIFTING PROBLEMS

Phone your Shaw-Box Distributor for help in selection or write us direct for literature.

60L-10

MAXWELL MANNING & MOORE TRADE MARK

OVERHEAD HANDLING EQUIPMENT

Products of

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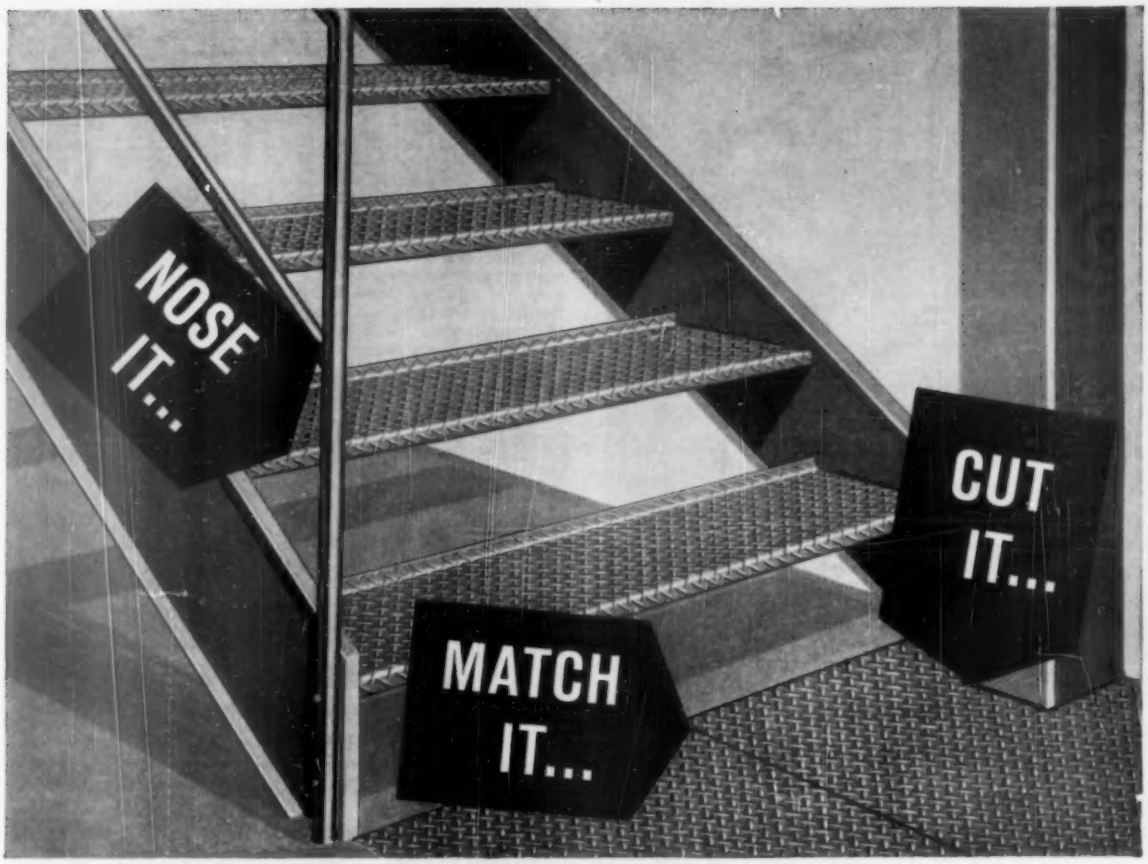

Alan Wood Super Diamond floor plate ...is easy to fabricate

Here's a heavy duty floor plate that can be sheared, formed, welded, and easily matched. The arrangement of the unique A. W. Super Diamond pattern allows you to bend it at any place.

A. W. Super Diamond will last for years... provides a safe, non-skid footing at all times. Easy to clean? A. W. Super Diamond can be swept, hosed or mopped easily . . . from any angle.

For easy fabrication and installation... for safety... for long wear ...specify A. W. Super Diamond. Write for Bulletin SD-S10.

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AIRMATIC MINIATURE AIR CYLINDERS

compact, space-saving and easily installed

Wherever space is at a premium, Airmatic Miniature Air Cylinders are today's number one selection for aiding in dependable, maintenance-free automation.

For activating electrical contacts in test jigs and fixtures—as miniature air vices—in automatic work for feeding, ejecting, soldering and many other applications. In fact, applications are limited only by the ingenuity of industry's design and production engineers.

Shown here, for example, is Airmatic No. C-1125 mounted on the gravity feed chute of a vibrating parts feeder.

The complete miniature line (with bores of ⅜", ½", ¾", 1", 1⅛", 1½" and 2") are designed with thick brass tube walls.

Airmatic products lead the field in quality, delivery, price! Get your copy of "Airmatic Cylinders for Automation", Bulletin 91017, today.

AX-24

AIRMATIC VALVE INC.
7313 Associate Ave., Cleveland 9, Ohio

Phone: WOodbine 1-5320 • Western Union: Airmatic Valve, Inc., FAX, Cleveland, Ohio

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BENNETT WASTE RECEPTACLES

for every requirement

TRADE MARK SANI-CAN PATENTED

Bennett, makers of the most complete line of waste receptacles in America, now offer, in addition, famous Sani-Can step-on receivers. Whatever your requirements for waste receptacles, you'll find the specific models you need in the Bennett catalogs.

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to make modernizing dollars mean the most, lay smart, new floors of—
Northern Hard MAPLE
the finest floor that grows
Most modern touch you can give to a building! These bright, smooth, enduring floors of delicately-grained MFMA Northern Hard Maple bring any space up-to-date like magic. A grade for every budget—all good grades! Use MFMA Maple or Birch. They're guaranteed. Write—
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553 Pure Oil Bldg., 35 E. Wacker Drive
Chicago 1, Illinois

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Illustrated is one of the six 12-cylinder Fairbanks Morse Instant Power Units (Generating Model 38 TD8 ⅛) just installed at Thule, Greenland, key American defense base, to power the giant radar screens that warn of approaching missiles or aircraft.

This is the world's fastest-starting diesel generator—and the most economical

Advanced opposed-piston design—an exclusive Fairbanks Morse development—makes this Instant Power Unit the world's fastest, most economical standby!

Within 30 seconds, it hums to peak power! Full, vibration-less power! Automatically! Sturdy, self-contained, a complete generating package that delivers more kilowatts at less cost in less time than any other unit.

A model to meet every need. Automatic or manually controlled. Accessories to your specifications. For utilities and other vital services. Produces up to 2500 KW at 900 rpm. Can be linked in multiple units to supply any volume of power for peaking, standby duty, dead load pick up.

No faster, better protection at any price than a Fairbanks Morse Instant Power Unit.

For full details or custom specifications, write today to: Mr. S. K. Howard, Director of Marketing, Diesel Products, Beloit Division, Fairbanks Morse & Co., Beloit, Wisconsin.

Fairbanks Morse

A MAJOR INDUSTRIAL COMPONENT OF FAIRBANKS WHITNEY CORPORATION

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IDEA! "Our wash fountain area is safer now with 'SCOTCH-TRED'!"
IDEA! "Our cloth cutting-room floors aren't slippery now. 'SCOTCH-TRED' gives a comfortable, safe footing!"

Everybody's talking about "SCOTCH-TRED"... the new IDEA material for greater efficiency, safety and protection!

Amazing new "SCOTCH-TRED"—the *resilient* non-slip surfacing material—is carpet quiet . . . tile tough! Pleasant textured surface is durable, long-wearing; brings new comfort and beauty to safety-conditioning. Easily cleaned with soap or water.

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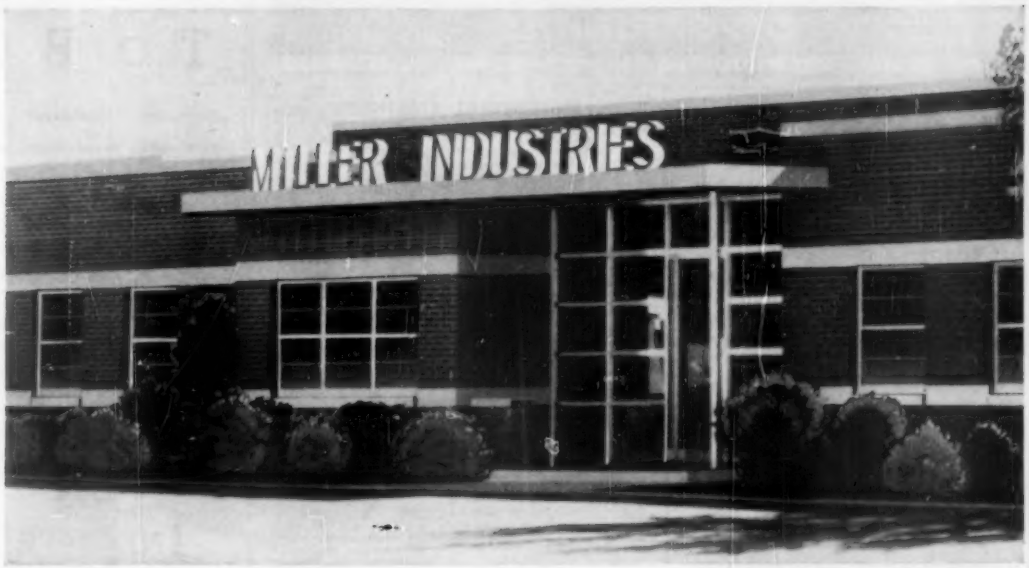
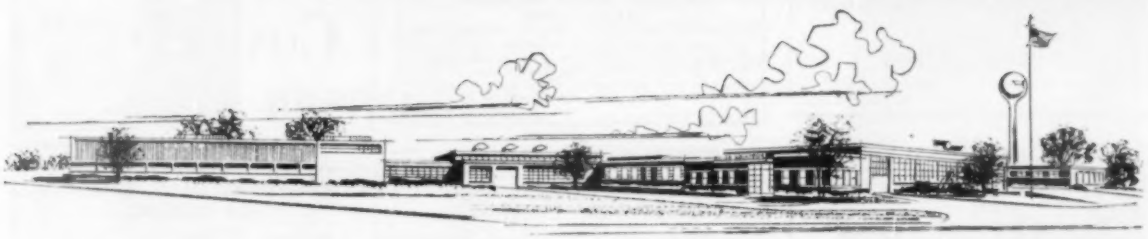
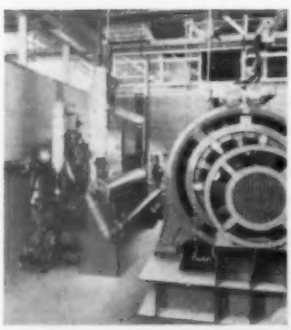
Acme ... the **practical** approach to process cooling





Anodizing production increased, finish improved



"In our previous method of anodizing (i.e. before Acme), the acids would build up heat and we'd have to stop anodizing to allow the acids to cool back down again. Not any more. Now, with our Acme packaged chillers, we can hold our acid bath solutions at constant low temperatures . . . no more production stoppages for cooling off periods. In addition, precision control, plus the colder temperatures we can now maintain, gives us a more uniform, harder anodizing finish." So states Larry Miller of Miller Industries, Inc., Reed City, Michigan, fabricators of aluminum products . . . and he added "We're very well satisfied with our Acme chillers."

Acme packaged chillers *are* ideal for plating applications. They're ideal, for that matter, for a host of industrial cooling jobs. They pack high capacity and cooling efficiency in a compact unit . . . compactness that allows you to install an Acme chiller most anywhere (see, top left, where Miller tucked one of their two 60-ton units). Then there's Acme packaging to simplify installation . . . Miller people installed their chiller themselves. Top it off with a complete line . . . an Acme chiller for every requirement . . . plus Acme's factory-certified performance guarantee and you can't do anything but win with Acme.

Acme INDUSTRIES, INC.

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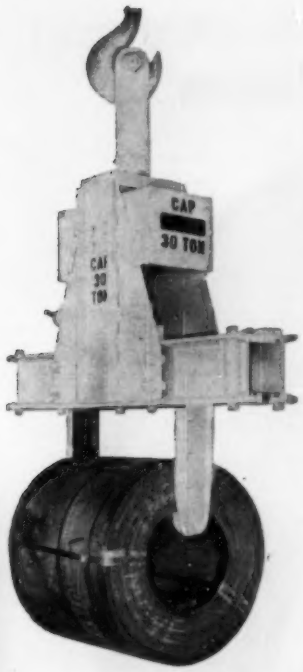

Telescoping rack-and-pinion design allows lifter arms maximum opening of 84 inches, minimum of 18 inches. Includes horizontal rotation to any position during 360° turning . . . pushbutton controlled by the crane operator.

HEPPENSTALL ROTATING COIL TONGS

Developed for a leading U.S. auto manufacturer, this lifter is for use in the company's sheet metal fabricating department for positioning coils to their requirements. ♦ In addition to increasing coil handling efficiency, the tongs prevent coil damage that frequently occurred with other handling methods. ♦ Wherever your materials handling operations involve a crane . . . whether it's coils, barrels or bales . . . pipes, boxes or rails . . . Heppenstall can handle it. Why not call Heppenstall now?

9261

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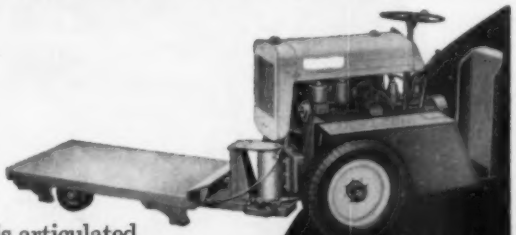

This articulated pivot (illustrated above) reduces turning radius to a minimum and gives the advantages of four-wheel steering. It entirely eliminates weaknesses and rapid wear common to complicated conventional steering mechanisms. It is similar to the system used on large, well-known earth movers.

Above is a typical Erickson Low-Lift Platform Truck. Standard models up to 10,000 lbs. capacity. Custom models up to 20,000 lbs. capacity. Platforms custom built up to 6 ft. wide, up to 24 ft. long.

Erickson Hi-Lift Platform Trucks have various platform sizes and lifts available. Stand-up cockpit (as shown) or operator's seat. Standard automotive controls are a feature of all Erickson Platform Lift Trucks.

ERICKSON
the Workhorse of Lift Trucks

Erickson Kart-All materiel-personnel carriers are available with scissors-lift platforms. Airline model shown above has standard baggage bed, 4,000 lbs. capacity. Custom models built with beds up to 8 ft. wide by 24 ft. long, up to 12,000 lbs. capacity. Hydraulic outriggers obtainable for stabilizing Kart-All when loading or unloading heavy loads.

ERICKSON POWER LIFT TRUCKS, INC.
273 St. Anthony Blvd. N. E., Minneapolis 18, Minn.

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split-second radio contact cuts high-speed production losses

1 Quality control inspector, who has located a problem, dials the Radio Pager of a foreman . . . by using one of the FM transmitter phones located at strategic points throughout the plant.

2 When the foreman hears a tone sound from the Radio Pager clipped to his belt, he presses a button and hears the verbal instructions thru the plug-type ear receiver used for clear reception in all areas.

3 Continental Can plant manager, W. K. Brown, hears all messages over his monitor unit. By constantly being informed of plant problems, he can step in personally when the situation warrants.

AT THE SAN JOSE PLANT OF CONTINENTAL CAN COMPANY

. . . a new quality control technique with

MOTOROLA Radio Pager

When Continental's inspectors detect potential flaws, adjustment instructions are immediately forwarded over the Motorola Radio Paging System to the personnel at the site of the problem. Instant corrective measures are then taken *BEFORE* a sudden flow of substandard cans would necessitate costly stoppage of the line. It's understandable why Motorola's Radio Pager has had a direct effect on reducing reject scrap and in cutting production downtime at this Continental Can Co. Plant.

The Motorola Radio Pager allows your firm to increase efficiency, save manhours and meet emergencies faster. Gone is the time wasted in chasing and tracing a certain man who is urgently needed . . . gone is the confusion of bells or public address calls. The Motorola Radio Pager slips in the pocket or clips to the belt . . . instantly, privately pages the wearer and quietly relays the message directed only to him. WRITE MOTOROLA TODAY FOR MORE INFORMATION.

"Handie-Talkie" is a trademark of Motorola Inc.

HANDIE TALKIE®

MOTOROLA Radio Pager

Motorola Communications & Electronics, Inc., 4501 Augusta Blvd., Chicago 51, Ill. A Subsidiary of Motorola Inc.

For more facts Circle 541 on Reader Service Card

FACTORY

Index To Advertisements

Acme Industries, Inc. 239
Acme Steel Company 173
Acme Visible Records, Inc. 207
Adams Company, Inc., R. P. 207
Aeroquip Corporation 153
Marman Division 10
Aget Manufacturing Co. 238
Airmatic Valve, Inc. 236
Alan Wood Steel Company 235
Allen-Bradley Company 121, 122
Allis-Chalmers 16
American Metal Products Co. 224
American Mutual Liability Insurance Co. 48, 49
American Sealants Company 189
Atlas Copco 227
Automatic Transportation Company 19

Badger Meter Mfg. Co. 210
Barreled Sunlight Paint Co. 43
Bassick Company 217
Bennett Manufacturing Co., Inc. 236
Borroughs Manufacturing Co. 198
Bostitch 11
Buffalo Forge Company 194, 195
Bulldog Electric Products, Div. I-T-E Circuit Breaker Co. 113

Calculagraph Company 220
Carrier Air Conditioning Co. 50, 223, 244
Champion Lamp Works 166
Chicago Pneumatic Tool Company .. 190
Cities Service Oil Co. 155
Clarage Fan Company 228
Cleveland Tramrail Division, Cleveland Crane & Engrg. Co. 226
Colorado Dept. of Development 238
Conforming Matrix Corporation 136
Cuno Engineering Works 26, 27
Cutler-Hammer, Inc. 160, 161

Darnell Corporation, Ltd. 200
Dennison Manufacturing Co. 118, 119, 179
Detrex Chemical Industries, Inc. 205
Dodge Manufacturing Corporation 108, 109
Dow Corning Corporation 151, 152
DuKane Corporation 191
duPont de Nemours & Co., (Inc.), E.I. 233

Eastman Kodak Company 211
Eckel Corporation 114
Elwell-Parker Electric Company 6, 7
Erickson Power Lift Trucks, Inc. 241
Equipto 112

Fairbanks, Morse & Co. 237
Federal-Mogul Service Div., Federal-Mogul-Bower-Bearings, Inc. 206
Felters Company 168
Fenwal, Inc. 18
Finnell Systems, Inc. 163
Fyr-Fyter Company 134

Gamewell Company 115
Gardner-Denver Company 181
General Electric Company 20, 21, 186, 187
Goodrich Industrial Products Co., B. F. 1
Goodyear, Industrial Products Div. .. 5

Graphic Systems 200
Grinnell Company 232
Greene, Tweed & Co. 188
Gulf Oil Company 14, 15

Hall Laboratories 229
Heppenstall Company 241
Hoover Ball & Bearing Co. 209
Hough Company, Frank G. 110
Hyster Company 37

Industrial Distributors (Sales) Ltd. of London 174, 175
Inland Steel Company 36

Jenkins Bros. 34
Johnson Service Company 22, 23

Kendall Company, Polyken Sales Division 125
Kidde & Company, Inc., Walter 8

Lamson Corporation 164, 165
LeBlond Machine Tool Co., R. K. ..... Second Cover
Le Roi Division, Westinghouse Airbrake Co. 159
Lincoln Electric Company 130, 131
Link-Belt Company 42, 156, 215
Lion Oil Company 212
Louisiana Department Of Commerce & Industry 126
Lubriplate Div., Fiske Bros. Refining Co. 114
Lyon Metal Products, Inc. 167

Machinery Electrification, Inc. 180
Manning, Maxwell & Moore, Inc. 234
Maple Flooring Manufacturers Assn. 236
Master Builders Company 225
McGraw-Hill Book Co. 218
Micro Switch, A Division of Honeywell 12, 13
Minnesota Mining & Manufacturing Co. 238
Motorola Communications & Electronics, Inc. 242

National Supply Company 185
Niagara Blower Company 192
Niagara Mohawk Power Corp. 4
Northern Natural Gas Company 218

Otis Elevator Company 44, 45

Pennsylvania Department of Commerce 188
Philadelphia Gear Corporation 9
Philco Government & Industrial Group 157
Pittsburgh-Corning Corporation 201-203
Pittsburgh Plate Glass Co., Paint Div. 35
Pittsburgh Plate Glass Co., Fiber Glass Division 47
Plant Maintenance & Engineering Show & Conference 107
Powell Company, Wm. 57
Purolator Products, Inc. 32, 33

Ramset Fastening System 117
Rapids-Standard Co., Inc. 52
Raybestos-Manhattan, Inc. 40, 41
Republic Steel Corporation 182, 183
Reznor Manufacturing Co. 129
Ridge Tool Company 17
Robot Industries, Inc. 240
Rockwell Manufacturing Co. 28, 29
Roebling's Sons Div., John A. 197
Roper Hydraulics, Inc. 158
Rotor Tool Company 137
Royal McBee Corporation 222
Ryder Truck Rental, Inc. 196

Sargent & Company 135
Schrader's Son, A. 46
Signode Steel Strapping Co. 138
Sinclair Refining Company 111
SKF Industries, Inc. 58
Square D Company .... 51, Third Cover
Standard Oil Company 193
Steiner Company 123
Stic-Klip Manufacturing Co., Inc. 234
Sun Oil Company 105
Swift & Company 180
Sylvania Lighting Prods., Div. Sylvania Electric Products, Inc. 24, 25

Texaco, Inc. 169-172
Thiokol Chemical Corporation 199
Toledo Scale Corporation 120
Trane Company 219
Triax Company 213

Ullman Devices Corporation 136
Union Steel Products Co. 178
Union Wire Rope Corporation 221
Unit Crane & Shovel, Corporation .. 230
United States Steel Corp. 116

Valdura Paint Division, American Marietta Co. 192
Valley Electric Corporation 200
Veeder-Root 231
Visual Plant Layouts, Inc. 188

Webb Company, Jervis B. 127
Westinghouse Electric Corporation 38, 39
Lamp Department 30, 31
Whiting Corporation 124
Wiegand Corporation 128
Worthington Corporation 210
Fourth Cover

Yale & Towne Manufacturing Co. .. 103

■

Industrial Consultants 240

■

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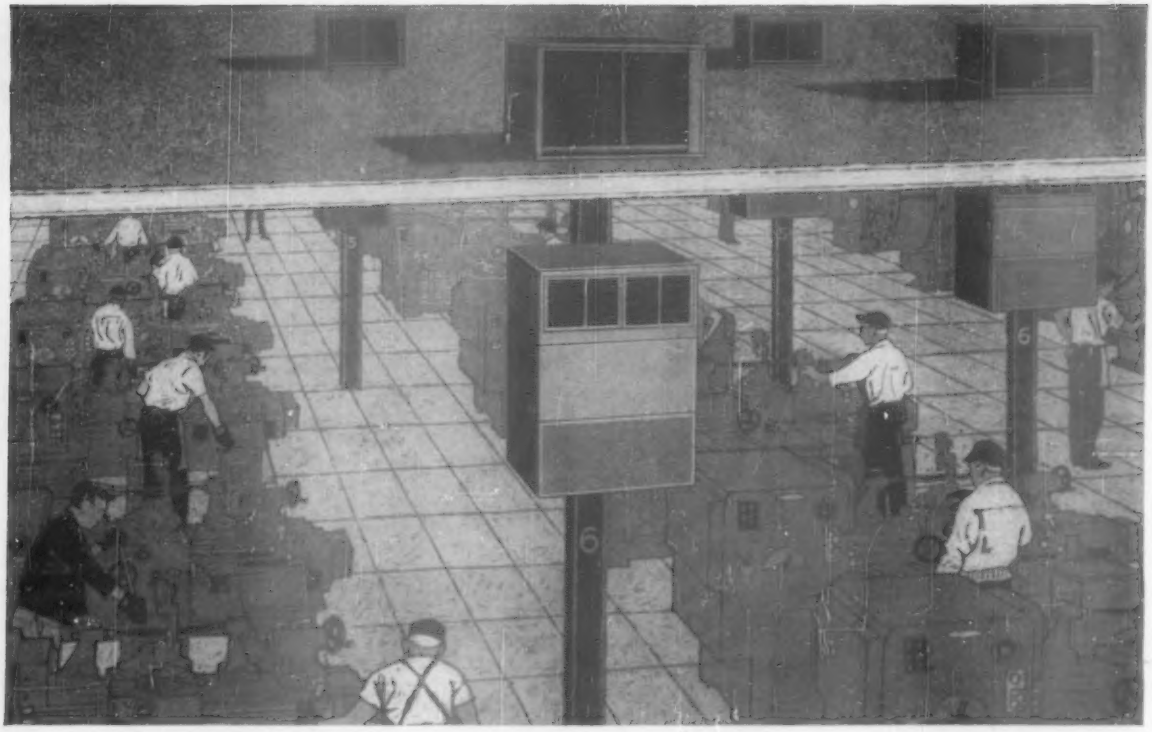
(Classified Advertising)
F. J. Eberle, Business Mgr.

■

Employment Opportunities 240
Special Services 240



Now Carrier Heat Pump Weathermakers are practical even in colder climates

If you are building a new plant, or replacing your present heating system, the Carrier Heat Pump Weathermaker* is a business investment that can save you money. It is no longer true that climate is a deterrent to choosing a heat pump. The improved designs of these all-electric Weathermakers combined with the heat load from concentrations of light, machinery and people in industrial applications now make it possible to operate heat pumps as economically in colder climates as many types of conventional systems.

Besides operating economies, these heat pumps are space-savers too. The indoor sections of these versatile Carrier units may be suspended from the ceiling, hung on the walls, or they may stand on the floor. The arrangement shown above is for a one-story plant of about 30,000 square feet. The indoor sections are hung on posts to allow the freedom of four-way air discharge; the outdoor sections are installed on the roof. Other arrangements can be tailored to your own particular requirements.

There are other dividends as well. Because it is all electric, soot, smoke, flame, fuel lines and storage tanks are eliminated from the heating system. Because it is also air-cooled, it requires no plumbing, water, or water towers. Because it is a one-system heating-and-cooling package, maintenance costs are cut. Fewer moving parts mean less servicing. And because it operates year-round, the normal expense resulting from seasonal startups and shutdowns is eliminated entirely.

Carrier manufactures a complete series of packaged heat pumps in addition to other air conditioning equipment. You can depend on your Carrier dealer to make an impartial recommendation best suited for you. Call him . . . he's listed in the Yellow Pages. Or write Carrier Air Conditioning Company, Syracuse 1, New York.

*Reg. U. S. Pat. Off.

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CATALOGS — 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26
27 28 29 30 31 32 33 34 35 36 37 38 39 40 41 42 43 44 45 46 47 48 49 50 51 52 53 54 55 56
57 58 59 60 61 62 63 64 65 66 67 68 69 70 71 72 73 74 75 76 78 79 80 81 82 83 84 85 86 87

EQUIPMENT — 88 89 90 91 92 93 94 95 96 97 98 99 100 101 102 103 104 105 106
107 108 109 110 111 112 113 114 115 116 117 118 119 120 121 122 123 124 125 126 127 128
129 130 131 132 133 134 135 136 137 138 139 140 141 142 143 144 145 146 147 148 149 150

MATERIALS — 195 196 197 198 199 200 201 202 203 204 205 206 207 208 209 210 211 212 213
214 215 216 217 218 219 220 221 222 223 224 225 226 227 228 229 230 231 232 233 234 235

IDEAS OF THE MONTH — 236 237 238 239 240 241 242 243 244 245 246 247 248 249 250 251 252
253 254 255 256 257 258 259 260 261 262 263 264 265 266 267 268 269 270 271 272 273 274

ADVERTISERS' LITERATURE — 275 276 277 278 279 280 281 282 283 284 285 286 287 288 289 290
291 292 293 294 295 296 297 298 299 300 301 302 303 304 305 306 307 308 309 310 311 312
313 314 315 316 317 318 319 320 321 322 323 324 325 326 327 328 329 330 331 332 333 334
335 336 337 338 339 340 341 342 343 344 345 346 347 348 349 350 351 352 353 354 355 356
357 358 359 360 361 362 363 364 365 366 367 368 369 370 371 372 373 374 375 376 377 378

ADVERTISEMENTS — 382 383 384 385 386 387 388 389 390 391 392 393 394 395 396 397 398 399
400 401 402 403 404 405 406 407 408 409 410 411 412 413 414 415 416 417 418 419 420 421
422 423 424 425 426 427 428 429 430 431 432 433 434 435 436 437 438 439 440 441 442 443
444 445 446 447 448 449 450 451 452 453 454 455 456 457 458 459 460 461 462 463 464 465
466 467 468 469 470 471 472 473 474 475 476 477 478 479 480 481 482 483 484 485 486 487
488 489 490 491 492 493 494 495 496 497 498 499 500 501 502 503 504 505 506 507 508 509
510 511 512 513 514 515 516 517 518 519 520 521 522 523 524 525 526 527 528 529 530 531
532 533 534 535 536 537 538 539 540 541 542 543 544 545 546 547 548 549 550 551 552 553
554 555 556 557 558 559 560 561 562 563 564 565 566 567 568 569 570 571 572 573 574 575
576 577 578 579 580 581 582 583 584 585 586 587 588 589 590 591 592 593 594 595 596 597
598 599 600 601 602 603 604 605 606 607 608 609 610 611 612 613 614 615 616 617 618 619
620 621 622 623 624 625 626 627 628 629 630 631 632 633 634 635 636 637 638 639 640 641
642 643 644 645 646 647 648 649 650 651 652 653 654 655 656 657 658 659 660 661 662 999

NAME..... TITLE.....
Card Good Only Through March 1961
COMPANY..... December 1960-2
CITY AND STATE
STREET.....

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CATALOGS — 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26
27 28 29 30 31 32 33 34 35 36 37 38 39 40 41 42 43 44 45 46 47 48 49 50 51 52 53 54 55 56
57 58 59 60 61 62 63 64 65 66 67 68 69 70 71 72 73 74 75 76 78 79 80 81 82 83 84 85 86 87

EQUIPMENT — 88 89 90 91 92 93 94 95 96 97 98 99 100 101 102 103 104 105 106
107 108 109 110 111 112 113 114 115 116 117 118 119 120 121 122 123 124 125 126 127 128
129 130 131 132 133 134 135 136 137 138 139 140 141 142 143 144 145 146 147 148 149 150

MATERIALS — 195 196 197 198 199 200 201 202 203 204 205 206 207 208 209 210 211 212 213
214 215 216 217 218 219 220 221 222 223 224 225 226 227 228 229 230 231 232 233 234 235

IDEAS OF THE MONTH — 236 237 238 239 240 241 242 243 244 245 246 247 248 249 250 251 252
253 254 255 256 257 258 259 260 261 262 263 264 265 266 267 268 269 270 271 272 273 274

ADVERTISERS' LITERATURE — 275 276 277 278 279 280 281 282 283 284 285 286 287 288 289 290
291 292 293 294 295 296 297 298 299 300 301 302 303 304 305 306 307 308 309 310 311 312
313 314 315 316 317 318 319 320 321 322 323 324 325 326 327 328 329 330 331 332 333 334
335 336 337 338 339 340 341 342 343 344 345 346 347 348 349 350 351 352 353 354 355 356
357 358 359 360 361 362 363 364 365 366 367 368 369 370 371 372 373 374 375 376 377 378

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PRODUCTION

1—Welding
2—Lathes
3—Die Casting Machines
4—Presses
5—Welder Carriage
6—End Mills
7—Lathes
8—Inserting Tool
9—Microstoning
10—Punches, Dies

MAINTENANCE

11—Lubricating Gun
12—Impact Tool
13—Spacer
14—Wear Strip

MECHANICAL

15—Transmission
16—Couplings
17—Sheaves
18—Drives
19—Sprockets
20—Transmission
21—Hydraulic Products

ELECTRICAL

22—Circuit Protection
23—Induction Motor
24—Variable Transformers
25—Raceway Systems
26—Precision Switches
27—Circuit Breakers
28—Power Systems
29—Distribution Systems

AUXILIARY

30—Pumps
31—Tank Heaters
32—Water Tanks
33—Boilers
34—Heating Elements
35—Filters
36—Telephone Systems

MATERIAL HANDLING

37—Casters
38—Bins
39—Screw Conveyors
40—Slings
41—Packaging
42—Belting
43—Rings, Slings
44—Packaging

PIPES AND VALVES

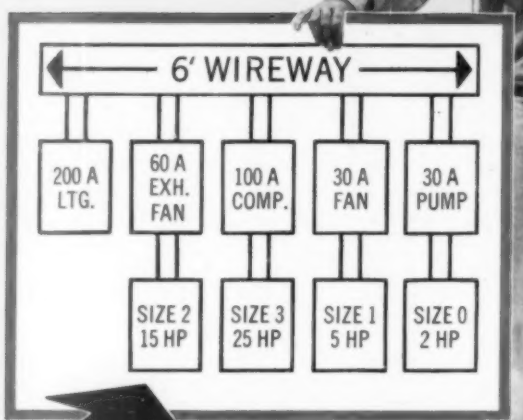
45—Couplings
46—Fittings and Flanges
47—Stainless Steel Tubing
48—Clamps
49—Check Valves
50—Mechanical Tubing
51—Clamps, Fasteners

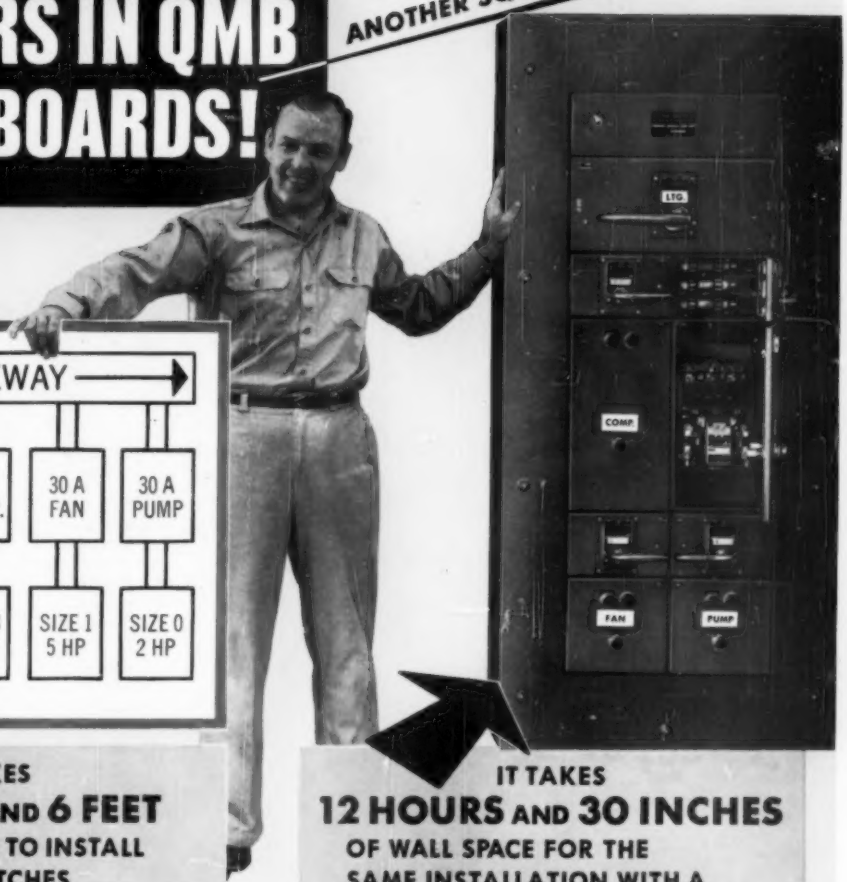
INSTRUMENTS AND CONTROLS

52—Recorder
53—Optical Comparators
54—Receiver Gauges
55—Composition Analysis System
56—Temperature Controls
57—Transductors

STARTERS IN QMB PANELBOARDS!

ANOTHER SQUARE D FIRST!





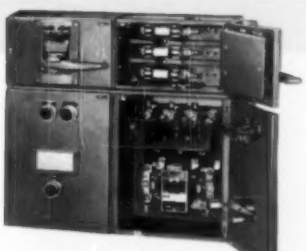
IT TAKES
41 HOURS AND 6 FEET
OF WALL SPACE TO INSTALL AND WIRE SWITCHES AND STARTERS LIKE THIS

IT TAKES
12 HOURS AND 30 INCHES
OF WALL SPACE FOR THE SAME INSTALLATION WITH A QMB STARTER PANELBOARD

QMB MEANS LESS TIME AND LESS SPACE PLUS

- **LOWER COST** • Time is money. The overall cost of QMB motor starters is usually less than that of separately installed starters and switches.
- **PLUG-IN FLEXIBILITY** • Plug-in switches and starters can be removed and installed in minutes. Minor circuit changes can be made without costly down time. Components easily rearranged if processes change.
- **ADDED SAFETY** • Interlocking prohibits opening starter or switch doors when switch is "ON."

QMB panelboards accommodate reversing and non-reversing starters, sizes 0 through 4. QMB switchboards and unit substations handle sizes 0 through 5. Part winding and two-speed starters available on order. All components available factory-assembled and wired. Enclosures, starters and plug-in switch units are also stocked by your Square D distributor for on-the-job assembly.



Notice how the PLUG-IN switch unit is mounted directly above the starter, permitting interlocking. The starter cannot be opened when the switch is in the "ON" position.

It's easy to order these starter and switch units. See your latest Square D Digest for further information.

SQUARE D COMPANY

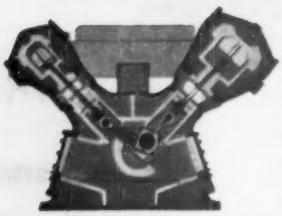
wherever electricity is distributed and controlled

For more facts circle 383 on READER SERVICE CARD

For more facts circle 384 on READER SERVICE CARD →

Will your next Y-type compressor have all of these

HIDDEN VALUES?



Frankly, it won't! Twenty-four of the values contribute to Worthington Y-type compressor performance. The other is fictitious—to see if you know enough about compressor quality to identify it. See page 210 for the *real* fictitious feature.

As you decide which 24 values are real, remember that they're not the obvious characteristics that show up on pressure gauges or price tables. They are true "values" that reveal themselves in your maintenance records ten years hence—when you find out that "those Worthington's are least expensive to run." Next time you specify a compressor, please see your local Worthington representative. Worthington Corporation, Compressor and Engine Division, Buffalo, N.Y. 36-9

WORTHINGTON

$1,000,000 ADDITION TO LABORATORY assures sound equipment designs based on actual research.

COMPOSITION TEST determines constituents of molten iron in each ladle before any casting is poured.

OPTIC COMPARATOR is used to check connecting rod bolt threads for uniform angles, lead and form.

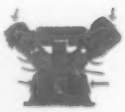
MAGNAFLUX AND MAGNAGLO inspections are widely used to expose surface imperfections.

PARCO-LUBRITING of critical wearing surfaces completely eliminates most start-up scuffing problems.

2000 CRAFTSMEN, these units built by same men who design and build large 5000 hp, 15,000 psi units.

COUNTERWEIGHTED CRANKSHAFT eliminates vibration and insures a smoother operation.

SELF-CLEANING OIL FILTER turns continuously to insure clean oil for pressure lubricating system.

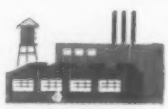


ACCESSIBILITY – valves, packing and main parts are easily observed and reached by operators.

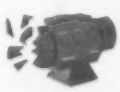
FAST SHIPMENT– two-stage 100-125 psi units are continuously stocked items, for quick shipment.

WATER-COOLED CRANKCASE keeps oil and compressor running gear at proper temperature.

CAPACITY CONTROL by-pass unloading, cool-operating suction valve unloaders, 3 step or 5 step option.



INTEGRATED DIV. includes foundry, manufacturing, sales, service and engineering in one location.



DESTRUCTION TEST of complete compressor cylinders verifies engineers' design calculations.

ASME DESIGN INTERCOOLER of straight tube construction externally mounted, is readily accessible.

CHOICE OF DRIVE – Flange mounted, Multi-V belt or direct coupled with tapered shaft, easy mounting.

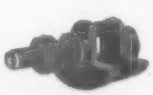
ARTICULATED CONNECTING ROD reduces crankshaft length, reduces weight and gives fewer parts.

FEATHER VALVE – industry's preferred compressor valve—is efficient, quiet, and low in maintenance.

SALES AND SERVICE INTEGRATION recognizes kinship of one to the other. One man administers both.

HONING of connecting rod crankpin and crosshead pin ends results in tighter fits, no loose shells.

PROFILOMETER inspection of highly finished parts assures easy break-in and long life.



ADJUSTABLE ROLLER MAIN BEARINGS feature low friction losses which help to extend compressor life.

PACKAGE UNIT shipped assembled – factory alignment unchanged and no field adjustment needed.

REMOVABLE DOWEL locks piston rod to crosshead – prevents turning due to loosened crosshead nut.

ULTRASONIC TEST – an advanced method of examining certain critical parts for internal quality.